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HARRIS (W. V.). **A Note on Termites from St. Helena.**—*Proc. R. ent. Soc. Lond.* (A) **28** pt. 1–3 pp. 13–14, 5 refs. London, 1953.

A species of *Heterotermes* (*Leucotermes*) that has caused damage to buildings in St. Helena and was at first misidentified as *Heterotermes* (*Termes*) *tenuis* (Hag.) [*cf. R. A. E.*, A **24** 494] was described by Silvestri as *L. perfidus* in 1936, and a collection of termites in the British Museum that was made in the island in 1939 includes specimens that are referable to it from three localities. On examination of specimens of *H. perfidus* collected in St. Helena in 1951, A. E. Emerson stated that they agreed well with *H. platycephalus* (Frogg.), of which in his opinion *H. perfidus* is a synonym. *H. platycephalus* has so far been known only from Australia, where it occurs in logs, stumps and dry wood and under stones, and is of no economic importance. It has evidently become injurious in the different environmental conditions of St. Helena.

The American termite, *Cryptotermes* (*Kalotermes*) *brevis* (Wlk.) is also recorded from St. Helena, where it was collected in 1939 in timber from blue-gum [*Eucalyptus*] at one place and in roof-beams at another. It had previously been found in South Africa [**38** 302], and has been reported from the Belgian Congo, Sierra Leone and, in 1951, from Nigeria.

[SOKOLOV (A. M.) & SOKOLOVA (R. A.).] СОКОЛОВ (А.М.) и СОКОЛОВА (Р.А.). **The Rôle of the Osmotic Pressure of the Cell Sap in the Resistance of Apple to the Green Apple Aphid.**—*Aphis pomi* **Deg.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **17** no. 2 pp. 12–18, 5 figs. Moscow, 1952.

Investigations in the Soviet Union in the summers of 1949 and 1950 showed that the intensity of the infestation of apple by *Aphis pomi* Deg. varied inversely with the osmotic pressure of the cell sap of the leaves. The pressure was greatest in the oldest leaves, at the base of a shoot, and lowest in the youngest leaves at the tip, and infestation was progressively greater from the lower to the upper leaves on a shoot. Similarly, shoots from the lower tier of the crown (in which the osmotic pressure was highest) were free from Aphids, whereas those from the upper tiers (which were younger and had a low osmotic pressure) were infested, particularly the topmost shoot. The osmotic pressure in the leaves increased with the age of the trees, and the latter became gradually more resistant to infestation. It varied, however, with many factors, and particularly with humidity, being low at the beginning of the season and rising during the summer, but decreasing during and after rain. The abundance of the Aphid on the trees fluctuated similarly. At the end of the season, the pressure invariably rose to a high level, and this coincided with the appearance of the sexuparae. The Aphids developed and reproduced on trees in which the osmotic pressure was about 3–10 atmospheres, but ceased feeding at higher pressures, congregated along the veins of the leaves and gradually died out.

LINDGREN (D. L.) & SINCLAIR (W. B.). **Effect of Ethylene Dibromide and Ethylene Chlorobromide Fumigation on *Citrus* and Avocado Fruits.**—*J. econ. Ent.* **46** no. 1 pp. 7–10, 6 refs. Menasha, Wis., 1953.

In further investigations on fumigants that might be used on fruits for the control of eggs and larvae of *Dacus ferrugineus dorsalis* Hend. if this fruit-fly should spread to California [*cf. R.A.E.*, A **40** 114], the effect of fumigation with 0·5 and 0·75 lb. ethylene dibromide or ethylene chlorobromide per 1,000 cu. ft. space for two hours at 75°F. on the quality of

(1383) Wt. P9/3884 10/53 E.P. Ltd. Gp. 566. [A]

Citrus and avocado fruits from various districts in California was tested, and the bromine residues in the fruits after fumigation were determined. Avocados, grapefruits, lemons and Valencia and navel oranges in boxes were fumigated with ethylene dibromide and all but navel oranges with ethylene chlorobromide, and there was no reduction in quality or suitability for storage. Avocados retained more bromine from either compound than did any variety of *Citrus* tested, and navel oranges absorbed and retained more bromine from ethylene dibromide than any other variety of *Citrus*. In all tests, the bromine content of the pulp was much less than that of the peel, and in the case of ethylene dibromide, it increased during the seven days after fumigation, bromine diffusing from peel to pulp during that period. There was rapid loss of bromine from the peel during the first 24 hours, but very little later.

It is concluded that ethylene dibromide could safely be used at the rate of 0·5 lb. per 1,000 cu. ft. at a minimum temperature of 70°F. for fumigation of the fruits concerned and that ethylene chlorobromide is promising.

Jeppson (L. R.), Jesser (M. J.) & Complin (J. O.). **Timing of Treatments for Control of Citrus Red Mite on Orange Trees in coastal Districts of California.**—*J. econ. Ent.* **46** no. 1 pp. 10–14, 5 figs., 7 refs. Menasha, Wis., 1953.

The following is based on the authors' summary. The results of weekly evaluations of populations of the active stages and eggs of *Paratetranychus* (*Metatetranychus*) *citri* (McG.) on treated and untreated Valencia orange trees in Orange County, California, from February 1951 to January 1952 are summarised. Low humidity, accompanied by wind, was found to produce temporary reductions in adult population. Single applications of acaricides, whenever made, did not control the mite for a complete year, but two applications, in March and September, of 12 oz. 50 per cent. wettable p-chlorophenyl p-chlorobenzenesulphonate (Ovotran) and 1 oz. 40 per cent. wettable di(p-chlorophenoxy)methane (Neotran) per 100 U.S. gals., or of 32 oz. 40 per cent. wettable di(p-chlorophenoxy)methane or 43 oz. 15 per cent. wettable 2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite (Aramite) per 100 U.S. gals. gave adequate control throughout the year. Applications at other times were less effective.

Sherman (M.). **Effects of Carbon Dioxide on Fruit Flies in Hawaii.**—*J. econ. Ent.* **46** no. 1 pp. 15–19, 1 graph, 8 refs. Menasha, Wis., 1953.

When the toxicity of insecticides to *Dacus cucurbitae* Coq., *D. ferrugineus dorsalis* Hend. and *Ceratitis capitata* (Wied.) was being studied in Hawaii, the separation of the fruit-flies according to species and sex by the usual procedure of attracting them to the glass front of a cage with a light and removing them with an aspirator or glass vial was found to be time-consuming. The effect of anaesthesia with carbon dioxide was therefore studied. Adult fruit-flies of two age groups were exposed in a specially designed chamber for 10, 20 or 30 minutes to carbon dioxide introduced at various pressures, and the concentration of gas within the chamber, the speed of anaesthesia, the time required for recovery and the subsequent mortality rates were noted.

It was found that introduction of the gas at pressures of 5, 10 and 30 lb. per sq. in. resulted in concentrations of about 10, 20 and 40 per cent. after one minute and 55, 65 and 85 per cent. after five, respectively. The minimum concentration required for anaesthesia was 20–40 per cent., and

the rate of inactivation increased with the rate of delivery of the gas. For all three species, introduction at a pressure of 5 lb. per sq. in. gave complete knockdown within six minutes, and exposure for ten minutes inactivated them long enough for sexing and counting. The fruit-flies showed similar reactions during inactivation and required 10–38 minutes after removal from the chamber before flight was resumed. Mortality of *D. cucurbitae* was not significantly increased by the treatment and was the same for both age groups. *D. f. dorsalis* and *C. capitata* were progressively less resistant, and although the addition of protein to the diet of *D. f. dorsalis* increased its resistance, it did not affect the rapidity of inactivation. Susceptibility could not be correlated with sex in either of these species, but was significantly higher in individuals 6–8 days old than in those 3–4 days old. Increasing gas concentration or exposure period increased mortality, but when exposure was limited to ten minutes, only the older group of *C. capitata* showed injury.

Inactivating the flies by this method saves time and labour, and the period of anaesthesia may be varied as needed. The equipment occupies little space, the amount of carbon dioxide needed is small and the flies are under constant observation. The same method may be used for marking fruit-flies for subsequent release and recovery.

BARTLETT (B. R.). **Natural Control of Citricola Scale in California.**—*J. econ. Ent.* **46** no. 1 pp. 25–28, 3 refs. Menasha, Wis., 1953.

Coccus pseudomagnoliarum (Kuw.) has been one of the most serious insect pests of *Citrus* in the interior of central California since 1914 and was equally injurious in the interior of southern California until 1934–35, since when it has been of little importance. Surveys of scale and parasite densities in ten untreated *Citrus* plots in 1950–52 indicated important differences in natural control in the two areas. In central California, the scale was distributed uniformly, whereas in southern California it occurred in colonies either within a grove or over wider areas, its distribution conforming to that of a pest that is partially controlled by natural enemies and survives longest in the more heavily infested foci. It appeared that the reduction by natural factors in southern California may culminate in nearly complete elimination of the scale at any time from May to December, the degree of control depending on the cumulative effect of killing the newly hatched scales by high temperatures in June–August and of parasitism of the second and early third stages and host feeding by *Metaphycus luteolus* (Timb.) in July–November, parasitism of the early third stage and host feeding by *M. helvolus* (Comp.) in July–January and parasitism of the late third stage by *M. luteolus* in May–July. Mortality due to high temperature affects the ultimate control by parasites, since these can readily destroy small populations but not large ones. Mortality of newly settled scales could not be correlated with size of tree, lack of irrigation or other cultural practices, but was increased by exposure to sunlight.

In order of effectiveness, the parasites found attacking the scale were *M. luteolus*, *M. helvolus*, *M. stanleyi* Comp. and *Coccophagus scutellaris* (Dalm.) in southern California, and *M. luteolus* and *C. lycimnia* (Wlk.) in central California. The influence of alternate hosts on their distribution and abundance is briefly discussed. *Coccus pseudomagnoliarum* has one generation a year throughout California. It hatches between mid-April and July in central districts and two weeks later in the south, and attains a size suitable for attack by *M. luteolus* and *M. helvolus* by July. *M. luteolus* increases rapidly until October–November, when the Coccid becomes physiologically unsuitable as a host, and again from May to July, when the

parasite develops gregariously in the older scales, and *M. helvolus* attacks it from July until December. In southern California, the balance is slightly in favour of biological control of the scale, depending on the successful survival of *M. luteolus* from November to May and on the abundance of *M. helvolus* in the autumn; the mortality caused by these parasites combined with the effects of high temperature on the young scales usually reduce even initially heavy infestations. In central California, the balance is predominantly in favour of the scale, except in areas of marginal scale reproduction, where the effectiveness of *M. luteolus* depends on its abundance early in the season; wherever infestation is heavy and parasitism is inhibited by deposits of road dust, ant activity or insecticides applied against associated pests, damage may become so severe before the parasites control the Coccid that chemical treatment is desirable.

Insecticides have considerable effect on parasite activity. Treatment with parathion at 1·5 lb. or less per acre against *C. pseudomagnoliarum* eliminates *M. luteolus* for 1–3 months, depending on temperature, but treatment after the beginning of October does not seriously hinder the parasite. DDT applied in spring against the citrus thrips [*Scirtothrips citri* (Moult.)] restricts early abundance of *M. luteolus* because of its persistent residues, but residues of dieldrin sprayed at 0·5 lb. per acre against the thrips have been shown to lose their toxicity to closely related *Metaphycus* species within 30 days. However, dieldrin should be used at the lowest rate consistent with adequate control if parasite populations are to be preserved.

The effect of periodic liberations of *M. luteolus* and *M. helvolus* in central California was tested in 1950–51. Release of *M. luteolus* in one plot in August 1950 did not produce a practical increase in parasitism, owing to adequate attack by naturally occurring *M. luteolus* in July, but might have been effective in 1951, when the parasite was not active early in the season. Periodic liberations of *M. helvolus* were made during August–September 1951 in one locality in an area of relatively warm winters and one in an area of cold winters. It spread very rapidly in both and emergence continued throughout the winter in the warm area but ceased in December in the cold one, and it is considered that the parasite was of value, though it did not give economic control of heavy infestations. *M. helvolus* is being released in several favourable areas of central California in an attempt to procure permanent establishment, and *M. stanleyi* and *Coccophagus scutellaris*, which are restricted in distribution, are also being liberated, since their absence from central California is apparently not due to climate.

Sweetman (H. L.), Benson (D. A.) & Kelley jr. (R. W.). **Efficacy of Aroma of Cedar in Control of Fabric Pests.**—*J. econ. Ent.* **46** no. 1 pp. 29–33, 7 refs. Menasha, Wis., 1953.

An account is given of tests in which experimental and commercial mixtures of the powdered wood and oil from the leaves of red cedar (*Juniperus virginiana*) alone or with 2·5 or 5 per cent. DDT, all combined with sufficient wall plaster to make them adhere permanently when applied to walls and allowed to dry, were tested for the control of *Tineola bisselliella* Humm., *Attagenus piceus* (Ol.) and *Anthrenus vorax* Waterh. The insects were enclosed in cages containing a layer of the cedar plaster about 0·12 in. thick to test vapour toxicity, exposed in a test chamber with the treated cages to determine repellency, or liberated in dormitories having treated and untreated cupboards containing woollen fabric, the rooms being sealed to prevent exit. The results showed that the vapour of the oil was not an effective repellent or fumigant against either larvae or adults of any of the

insects. The addition of DDT rendered the plaster sufficiently repellent and toxic to give some, but not adequate, protection. Spraying or dusting fabrics and crevices in cupboards with DDT has been shown to give complete protection with considerably less labour and cost. The possible protective value of the vapour in airtight chests [*cf. R.A.E.*, A **40** 168] was not tested.

CHADBOURNE (D. S.) & RAINWATER (C. F.). **Histological Effects of Calcium Arsenates, DDT, and Dieldrin on Larval Tissues of the Bollworm.** —*J. econ. Ent.* **46** no. 1 pp. 44–48, 7 figs., 8 refs. Menasha, Wis., 1953.

The following is based on the authors' summary. Histological studies were made on the effects of calcium arsenate administered orally in water and DDT and dieldrin applied topically in xylene to larvae of *Heliothis armigera* (Hb.). The techniques employed in fixing, staining and sectioning the material are given. The mid-gut and muscles adjacent to it showed marked degeneration following the administration of calcium arsenate, and it was apparent that death was due to a destruction of the epithelial lining of the mid-gut. The high dosage of calcium arsenate used and the time before the larvae became moribund (6–16 hours) might account for the slight clumping of the nuclei in the muscle tissue. The lack of any significant histological changes in DDT-treated larvae was in close agreement with previous findings. Treatment with dieldrin caused marked degeneration or other abnormalities of the alimentary canal, mid-gut, fat-body and muscles, and possibly part of the Malpighian tubules. No effect on the nervous system was detected by the techniques employed.

COLLINS (W. E.) & KING (H. L.). **A modified Technique for Laboratory Evaluation of Contact Insecticides.**—*J. econ. Ent.* **46** no. 1 pp. 51–53, 5 refs. Menasha, Wis., 1953.

The authors describe a method of obtaining known deposits of insecticides on filter paper and of testing them on adults of *Tribolium confusum* Duv., and exemplify it by an account of experiments in which the insecticide used was DDT in the form of a 50 per cent. wettable powder. The powder was kept in suspension in distilled water by an electric mixer, an aliquot portion was poured quickly on to a filter paper in a Büchner funnel, and the water was drawn off by vacuum. When the filter paper was dry, it was put in a vial; it was coated at the edge with vaseline to hold it to the glass and help to confine the beetles on it. Series of vials each containing ten beetles were stored in a rack that held them at an angle of 45° to prevent the beetles from crawling up the glass surface. After the required period of exposure, the beetles were kept for 7–8 days in vials containing a layer of whole-wheat flour and then placed on paper. Those unable to crawl were considered dead.

In tests in which the beetles were exposed for 1–24 hours to deposits of 14–229 mg. DDT per sq. ft. at 68–78°F. and 28–34 per cent. relative humidity, there were highly significant differences in the results given by the different deposits and by the different exposure periods. The exposure period appeared to be the more important, 40·7 per cent. mortality being given by exposure for one hour to a deposit of 229 mg. per sq. ft. and for three hours to one of 33 mg. When the beetles were kept before, during and after exposure at a constant temperature of 59 or 80°F. and about 33 per cent. relative humidity and were exposed to deposits of 33 or 61 mg.

DDT per sq. ft. for three hours, mortality was significantly greater at the lower temperature in each case [*cf. R.A.E.*, A **40** 345, etc.], but when they were kept at 80°F. and constant relative humidities of about 33 or 69 per cent., the same exposures resulted in no significant differences in mortality due to the different humidities, though the curve obtained by plotting the results indicated that significant differences might occur with other deposits of DDT. Adults 7 or 54–58 days old exposed to deposits of 33–122 mg. per sq. ft. at 80° and 69 per cent. relative humidity showed no difference in mortality due to age when the period of exposure was three hours, but mortality was very significantly higher for the older beetles when it was six hours. When treated filter papers were stored at room temperature and humidity for one day or one month before being used, storage time did not affect mortality after exposure of the beetles for three or six hours.

Newcomer (E. J.) & Dean (F. P.). **Control of Woolly Apple Aphids in Orchards sprayed with DDT.**—*J. econ. Ent.* **46** no. 1 pp. 54–56, 4 refs. Menasha, Wis., 1953.

The early use of DDT on apple in the Pacific Northwest of the United States greatly increased infestation by *Eriosoma lanigerum* (Hsm.), and records made in 1946 showed very low parasitism of the Aphid by *Aphelinus mali* (Hald.) and high Aphid infestation in orchards sprayed with DDT and high parasitism and correspondingly low Aphid infestation in orchards sprayed with lead arsenate or cryolite.

In 1947–50 observations were made in orchards that were sprayed with DDT on the effect on the Aphid of various materials added to the sprays primarily for the control of mites [*cf. R.A.E.*, A **41** 79]. Very effective control was given by the addition of 1 lb. BHC (10–12 per cent. γ isomer) per 100 U.S. gals. to one spray early in the season, of 0·33–0·5 lb. 15 per cent. parathion or 1 U.S. pint 48 per cent. malathon per 100 U.S. gals. to three sprays, of 2 lb. xanthone with oil and a colloidal spreader in 3–4 sprays or of 1 U.S. pint 50 per cent. toxaphene in 2–5 sprays, but TEPP [tetraethyl pyrophosphate], EPN [O-ethyl O-p-nitrophenyl benzenethiophosphonate], Aramite [2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite], di(p-chlorophenoxy)methane, CS-708 [a 1 : 2 mixture of 1,1-bis(p-chlorophenyl)-2-nitropropane and 1,1-bis(p-chlorophenyl)-2-nitrobutane], dinitrocaprylphenylcrotonate, DMC [1,1-bis(p-chlorophenyl)ethanol], lauryl-2-thiazolinyl sulphide, mineral oil, nabam [disodium ethylene bisdithiocarbamate] and R-242 [p-chlorophenyl phenyl sulphone] were ineffective.

In 1951, on trees on which methoxy-DDT (methoxychlor) was used instead of DDT, the addition of 1 lb. 25 per cent. malathon or 0·5 U.S. pint 50 per cent. malathon or of 1 U.S. pint Metacide [6·2 per cent. parathion, 24·5 per cent. methyl-parathion and 2·7 per cent. related organic phosphates] per 100 U.S. gals. controlled the Aphid, whereas EPN and CS-708 did not.

Yeomans (A. H.) & Rogers (E. E.). **Factors influencing Deposit of Spray Droplets.**—*J. econ. Ent.* **46** no. 1 pp. 57–60, 2 refs. Menasha, Wis., 1953.

The following is substantially the authors' summary. An account is given of tests on the requirements for efficient deposition of toxicants from sprays with the least contamination of the surrounding air. Some of the basic factors influencing the behaviour of spray droplets and their deposition on surfaces are discussed. Droplet size was measured microscopically on

samples collected on a slide, and the percentage of deposit from measured amounts of sprays determined by spraying absorbent paper and weighing the deposit.

Nozzles of several types were tested, and all were found to deposit the spray on a surface in a similar way. Almost all the droplets from sprays directed downwards were deposited. When the sprays were directed horizontally towards a vertical surface, the amount of deposit decreased as the distance between nozzle and surface increased; the decrease was gradual as the amount of deposit fell to about 75 per cent. and was then rapid. The deposit was greater when enough spray was released to generate an air stream in the direction of the spray, and the distance at which 75 per cent. of the spray was deposited was greater with larger droplets, narrowed spray angle or greater output. In sprays directed upwards, the effective distance between nozzle and surface was greatly decreased.

The results demonstrated that the distance between nozzle and surface should be limited to that which will permit 75 per cent. or more of the spray to be deposited and that the mass median diameter of the droplets should be at least 50 μ, to minimise the drift of undeposited spray.

Nishida (T.) & Haramoto (F.). **Immunity of *Dacus cucurbitae* to Attack by certain Parasites of *Dacus dorsalis*.**—*J. econ. Ent.* **46** no. 1 pp. 61–64, 12 refs. Menasha, Wis., 1953.

Various parasites of the genus *Opius* have been introduced into Hawaii for release against *Dacus ferrugineus dorsalis* Hend. [*cf. R.A.E.*, A **41** 155, etc.], and the most effective have been found also to parasitise *Ceratitis capitata* (Wied.). The investigations described were carried out to determine whether they attack *D. cucurbitae* Coq., the other fruit-fly present in the Territory. Although the habitats of the two species of *Dacus* are generally distinct, certain areas were found in which they overlapped. Collections of larvae from these areas showed considerable variation in the proportions of the two, but it was evident that they can live in the same habitat in both the larval and adult stages. Parasites were obtained from only a few of the collections, and all emerged from samples of larvae collected on papaya that gave rise to both fruit-flies or to *D. f. dorsalis* only, samples that gave rise to *D. cucurbitae* only proving not to be parasitised. All the parasites obtained were *Opius oophilus* Fullaway [*cf. loc. cit.*]. No parasites were reared from puparia of *D. cucurbitae*.

Laboratory studies showed that *O. oophilus* oviposited in eggs of *D. cucurbitae* but failed to complete its development in this host, though it caused considerable egg mortality. Host eggs that failed to hatch after exposure to the parasites were found to contain dead fruit-fly larvae in which were newly hatched but dead parasite larvae or parasite eggs. A few parasitised eggs hatched, but though living parasite larvae occurred in host larvae in the first instar, only dead ones were found in those in the third instar. Several other species of *Opius* oviposited in the larvae of *D. cucurbitae* in the laboratory, but the eggs were attacked by phagocytes and failed to develop. There was no evidence of phagocytosis among eggs of *O. oophilus* in eggs of *D. cucurbitae*.

Holloway (J. K.) & Hueffaker (C. B.). **Establishment of a Root Borer and a Gall Fly for Control of Klamath Weed.**—*J. econ. Ent.* **46** no. 1 pp. 65–67, 4 refs. Menasha, Wis., 1953.

Because of the variety of ecological conditions under which klamath weed (*Hypericum perforatum*) thrives in California, it seemed unlikely that the

two introduced leaf-feeding Chrysomelids would give maximum control throughout its entire distribution [*cf. R.A.E.*, A **41** 207, etc.], and the Buprestid, *Agrilus hyperici* (Crtz.) [*cf.* **37** 341], and the Cecidomyiid, *Zeuxidiplosis giardii* (Kieff.), were introduced from Europe in 1950 for additional control.

Agrilus was introduced as mature larvae in *Hypericum* roots, and two colonies were liberated in California in May 1950 and became established. It has one generation a year. The young larvae feed in the root crowns until fully grown and hibernate there, and adults begin to emerge in June and are active throughout June and July, when there is an abundance of foliage suitable for food and temperature and humidity are favourable. The insect is thus protected from possible adverse conditions throughout most of its life. It destroys the roots so completely that the plant sometimes dies, and has thinned dense stands, but has not yet given complete control in any area. It killed 40–80 per cent. of the plants in one place in a single season, and might give complete control after several years. It is likely to prove useful in woodland, or where cattle and sheep are concentrated for short periods during maximum egg deposition and larval development of the Chrysomelids. It is distributed by releasing adults, collected by sweeping in June and July, in open infested fields or by transplanting infested plants.

Z. giardii was introduced in galls on heavily infested cut branches of *H. perforatum*. The adults were too easily injured to be transferred to infested areas for release, but they readily oviposited in the greenhouse on potted plants, which were later moved to the desired areas. Releases were made in five counties in California, and establishment is known to have occurred in two of them. The fly tends to concentrate in damp places, and one colony gave good control of the weed over an area 50–100 ft. in diameter during the wet season. The young larvae hibernate in the leaf buds and resume development late in the winter, after which normal galls develop. The adults emerge and oviposit on leaves and stems, and the young larvae enter the leaf buds. Two or three generations may be produced during the spring and early summer. Gall production is reduced during the drier part of the summer, but there is another marked reproductive period during the autumn rainy season, when the new procumbent basal foliage of the weed appears, and there are usually one or two autumn generations before hibernation begins. The fly curtails the growth of the terminal buds, and, owing to its rapid rate of increase, effectively controlled the weed in a small test area in one year, nearly all the plants dying early in the summer. It was distributed on a large scale by exposing potted plants in a field colony during the reproductive period and moving them to new districts when infested and by transplanting infested plants during the spring. It may prove useful in marshy or irrigated areas, where the Chrysomelids are relatively ineffective, or in wooded brush areas.

Chiang (H. C.) & Hodson (A. C.). **Leaf Injury caused by the first-generation Corn Borer in Field Corn.**—*J. econ. Ent.* **46** no. 1 pp. 68–73, 2 figs., 5 refs. Menasha, Wis., 1953.

During an intensive study in Minnesota in 1948–51 of the relations between populations of the corn borer [*Pyrausta nubilalis* (Hb.)] and damage to maize plants, observations were made on the leaf-feeding of the first-generation larvae and the resulting leaf injury and on the relation between the appearance of leaf injury and the growth stage of the plants, the time when injury occurred and the level of borer population.

Three types of leaf injury were distinguished. Pin-holes, occurring usually on the upper surface of a leaf, were caused by larvae feeding in the whorl

when the leaves were loosely rolled but not completely exposed and were found on all plants, regardless of their date of planting and age at the time of infestation. Shot-holes were found on the earliest planted maize on the leaves next to the tassel and were caused by larvae in the second or third instar chewing through the rolled leaves at the centre of the whorl. Large feeding holes, irregular in shape, were found only on early-planted maize and on leaves lower than those with shot-holes and above most of those with pin-holes; they were caused by larvae in the second or third instar that were present when the whorl was still composed entirely of leaves.

Observations on artificially injured plants indicated that the period between the time of initial feeding and the time when the injury became visible varied with the stage of plant growth but did not exceed six days at any stage studied in 1950, and in field observations on the relation between the extent and rate of appearance of leaf injury and the level of natural infestations in experimental plantings, the extent of leaf injury varied with the level of initial infestation, and the rate of appearance of leaf injury with weather conditions. The seasonal increase in leaf injury appeared to be a more direct indication of the seasonal increase in the number of active larvae and, consequently, of the potential damage to the crop, than the number of egg-masses or the percentage of hatching, and it is suggested that the need for insecticidal treatment and its timing can be based on the percentage of plants showing leaf injury, without considering the numbers of egg-masses or the date of first hatching. Field tests should be carried out to verify the practical validity of the method and to establish critical levels of leaf injury for specific needs.

Michelbacher (A. E.), Bacon (O. G.), Middlekauff (W. W.) & Erwin (W.). **Tomato Insect Investigations in northern California in 1951.**—*J. econ. Ent.* **46** no. 1 pp. 73–76. Menasha, Wis., 1953.

None of the insecticides normally used against pests of tomato in California is effective against the leaf-miner, *Liriomyza subpusilla* (Frost), which is present in most tomato fields and causes considerable injury in localised areas in the north of the State [*cf. R.A.E.*, A **39** 255]. Aldrin, dieldrin and heptachlor are known to control this Agromyzid, and in 1951, these, DDD (TDE) and Q-137 [ethyl-DDD (1,1-dichloro-2,2-bis(p-ethylphenyl) ethane)] with sulphur were compared in dusts with sulphur alone for the control of *L. subpusilla* and Lepidopterous larvae attacking the crop. Dusts containing 5 per cent. DDD with 75 per cent. sulphur or 5 per cent. Q-137, 3 per cent. aldrin or heptachlor or 1·5 per cent. dieldrin with 50 per cent. sulphur, applied at 30 lb. per acre on 23rd July and 30th August, all reduced the proportion of damaged fruits, as compared with a single application of 98 per cent. sulphur, on plants infested by *Heliothis armigera* (Hb.), *Laphygma exigua* (Hb.), *Prodenia praefica* Grote, *Protoparce sexta* (Joh.) and *P. quinquemaculata* (Haw.). DDD was markedly the most effective.

P. sexta was much more abundant than *P. quinquemaculata* and caused considerable injury before each application; in September, the numbers of plants damaged in 450 ft. of row averaged 15·75 after treatment with sulphur, 9·25, 6·75 and 5 after treatment with heptachlor, aldrin and dieldrin, and 3·25 and 0·5 after treatment with Q-137 and DDD, respectively. Dieldrin gave the best control of *Liriomyza* in the leaves, against which DDD and Q-137 were relatively ineffective and aldrin and heptachlor intermediate in value. None of the materials appeared to affect the flavour of the tomatos and all left only traces of residues on unwashed fruits picked immediately

after the last application from plants that were dusted in July and August and also on 27th September.

As aldrin, dieldrin and heptachlor were less effective than DDD against the Lepidopterous larvae, they should probably be used only where *Liriomyza* threatens to become harmful. Timely applications of any of them should then give effective control, and a single treatment should remain effective for at least three weeks.

TASCHENBERG (E. F.). **Control of Grape Berry Moth with synthetic organic Insecticides.**—*J. econ. Ent.* **46** no. 1 pp. 77–84, 1 graph, 8 refs. Menasha, Wis., 1953.

The results are given of further tests of chlorinated hydrocarbons and organic phosphorus compounds for the control of *Polychrosis viteana* (Clem.) on grape vines, carried out in New York in 1949–51 [*cf. R.A.E.*, A **38** 431]. A spreader and adhesive was included in each spray unless the insecticide was formulated as an emulsion concentrate. Spray quantities are per 100 U.S. gals. and are given in lb. for wettable powders and in fl. oz. for emulsion concentrates.

In 1949, two applications of 1·5 lb. 50 per cent. DDT on 23rd June and 4th July against the first generation were ineffective, but two against the first and one against the second were very effective when the third was made on 26th July, but not when it was delayed until 8th August. Four applications of 2 lb. 25 per cent. heptachlor, dieldrin or aldrin in June–August were useless.

The same amount of DDT, 2 lb. 50 per cent. methoxy-DDT (methoxychlor), 1·5 lb. 15 per cent. parathion, 16 fl. oz. 33 per cent. Metacide [6·2 per cent. parathion, 24·5 per cent. methyl-parathion and 2·7 per cent. related organic phosphates] and 1 lb. 27 per cent. EPN [O-ethyl O-p-nitrophenyl benzenethiophosphonate] gave poor results when applied once immediately after blooming and once against the second generation in 1950, but good control when applied twice against the first generation and once against the second in 1950 and 1951. In 1951, 15 per cent. parathion was effective at 1 lb. and 50 per cent. Metacide at 8 fl. oz., and three applications of 2 lb. 25 per cent. Q-137 [ethyl-DDD (1,1-dichloro-2,2-bis(p-ethylphenyl)ethane)] or 8 fl. oz. 50 per cent. Potasan [4-methylumbelliferone O,C-diethyl thiophosphate] were also promising. One delayed application against the first generation and one against the second (10th July and 22nd August) of 50 per cent. DDT at 1·5 lb. in the first and 1 lb. in the second spray or of 1 lb. 15 per cent. parathion or 27 per cent. EPN were also effective in 1951, whereas 2 lb. 25 per cent. malathon, 1 lb. 25 per cent. demeton [O,O-diethyl O-2-(ethylmercapto)ethyl thiophosphate] (Systox) and 1 lb. 25 per cent. Potasan were not.

Substituting 1 lb. 15 per cent. parathion for 1·5 lb. 50 per cent. DDT in the last one or two sprays or 2 lb. 50 per cent. methoxy-DDT or a mixture of 0·75 lb. 50 per cent. DDT and 0·25 lb. 25 per cent. parathion in the last one of the three-spray schedule did not reduce its effectiveness. In schedules of three or four sprays, 1·5 lb. 50 per cent wettable DDT was more effective than 0·75 lb. but not than 1lb., and as effective as 11 oz. 75 per cent. wettable DDT. When applied twice against the second generation, 15 per cent. parathion and 27 per cent. EPN at 0·5 or 1 lb. were very effective, but 1 lb. 25 per cent. Potasan, demeton or malathon was not. Metacide caused some injury to fruit and foliage in 1950 but not in 1951; the other materials were harmless.

In tests against the individual stages of the moth, sprays of 1 lb. 15 per cent. parathion gave 85–92 per cent. kill as estimated by Abbott's formula

[**13** 331] and 1·5 lb. 25 per cent. malathon and 8 fl. oz. 50 per cent. Metacide more than 75 per cent. kill of eggs in the field, whereas EPN, demeton and Potasan gave poor control. Laboratory tests confirmed the effectiveness of parathion. The embryos continued to develop after treatment with it, but failed to emerge from the egg. Sprays containing 1 lb. 25 per cent. parathion, malathon, Potasan or demeton or 1 lb. 27 per cent. EPN all gave complete kill of first-generation larvae in the grapes, but only parathion and 8 fl. oz. 50 per cent. Metacide were effective against the second generation. High mortality of pupae was not given by 2 lb. 15 per cent. parathion or 27 per cent. EPN.

It is concluded that DDT is one of the most effective chlorinated hydrocarbons tested against *P. viteana*, three applications giving commercial control and also practically eliminating *Erythroneura comes* (Say) and providing protection against *Fidia viticida* Walsh, but leaving high harvest residues. Parathion gave comparable results and was not reduced in effectiveness by the addition of bordeaux mixture or a copper compound of low solubility and lime. EPN gave poorer results, but has given excellent commercial control, possibly because deposits of it afford protection for a long period.

Taschenberg (E. F.). **Evaluation of Petroleum and Vegetable Oils on Grape Berry Moth Eggs.**—*J. econ. Ent.* **46** no. 1 pp. 85–91, 11 refs. Menasha, Wis., 1953.

Before the introduction of DDT, *Polychrosis viteana* (Clem.) was controlled on grape vines in New York by sprays of lead arsenate with bordeaux mixture, followed by fixed nicotine. In order to increase the effectiveness of the lead-arsenate sprays, a miscible oil was added to give ovicidal properties and increase wetting and adhesion, and an account is given in this paper of laboratory investigations on several summer oils of different structural composition. The following is based on the author's summary of the work.

The ovicidal efficiency of both conventional and highly refined petroleum oils was found to be closely correlated with paraffinicity, oils with a composition high in paraffinic structures being the most efficient. The addition of bordeaux mixture and lead arsenate reduced the ovicidal effect, and the reduction became greater as the strength of the bordeaux mixture was increased. A greater oil deposit was required for 95 per cent. kill when the arsenical and fungicide were added to the oil, and since these materials caused no reduction in oil deposit, the decrease in efficiency occurred apparently because the oil was absorbed by the added materials.

Of the vegetable oils tested for comparison, cottonseed oil was slightly superior to groundnut or linseed oil, but it also decreased in toxicity when lead arsenate and bordeaux mixture were added to it, the effect being similar to that observed for petroleum oil.

Richardson (B. H.). **Control of Onion Thrips in the Winter Garden Area of Texas.**—*J. econ. Ent.* **46** no. 1 pp. 92–95, 16 refs. Menasha, Wis., 1953.

Thrips tabaci Lind. reduces the production of onions almost every year in south-western Texas, and both plant crops for supply to northern growers and the bulb crop must be protected from it. After the onion harvest, the thrips migrate to other crops and sometimes need controlling on these.

In tests of organic insecticides [*cf. R.A.E.*, A **40** 234] in the Winter Garden area in 1952, dusts were applied at 15–20 lb. per acre. Of the

chlorinated hydrocarbons, aldrin, isodrin, dieldrin and endrin * were used at 2·5, 1, 1·5 and 1 per cent. respectively, heptachlor at 5 per cent., toxaphene at 20 per cent. and γ BHC at 1 per cent. with 5 per cent. DDT. Endrin gave poor immediate control, but heptachlor and the others caused 94 and 76–88 per cent. reduction in population, respectively, after one day, as compared with no treatment, and heptachlor, dieldrin and aldrin 72, 70 and 61 per cent., respectively, after 11 days. Of the dusts containing phosphorus compounds, 1 per cent. parathion or Metacide [6·2 per cent. parathion, 24·5 per cent. methyl-parathion and 2·7 per cent. related organic phosphates] and 5 per cent. EPN [O-ethyl O-p-nitrophenyl benzenethiophosphonate] or malathon gave 74–84 per cent. reduction in one day, whereas 1 per cent. demeton [O,O-diethyl O-2-(ethylmercapto)ethyl thiophosphate] (Systox) gave only 44 per cent.

In a test of the effects of diluents and adhesives on dusts of 10 per cent. DDT or of 5 per cent. DDT with 1 per cent. γ BHC, the addition of 50 per cent. sulphur appeared to reduce the effectiveness of the mixture both immediately and after six days; the addition of a proprietary adhesive rendered the mixture ineffective after six days and reduced the effect of the 10 per cent. DDT.

In tests with an aldrin spray used at 0·75 lb. toxicant per acre, counts made at about weekly intervals showed that significant control of the thrips was given by 9–12 applications at intervals of 5–7 days, whereas the reductions in population that followed 5–6 applications at intervals of 10–12 days were not statistically significant. All treated plots gave significantly higher yields than untreated ones.

Raffensperger (E. M.) & Rutschky (C. W.). **A Comparison of Ovicides against Corn Earworm Eggs.**—*J. econ. Ent.* **46** no. 1 pp. 100–102, 3 refs. Menasha, Wis., 1953.

A study of the bionomics of the corn earworm [*Heliothis armigera* (Hb.)] on maize and preliminary field investigations indicated that ovicides might give useful control. In Pennsylvania, most of the eggs are deposited on the maize silks and require 3–4 days for hatching under optimum conditions. Ovicides affect eggs laid up to about three days before treatment, and applications need not be timed so accurately as those against larvae. Penetration of the silk channel is not necessary as it is against the larvae, so that the need for expensive non-phytotoxic oils is eliminated, there is little danger of contaminating the ear itself, and residual effect is of litfle importance.

EPN [O-ethyl O-p-nitrophenyl benzenethiophosphonate] and Ovotran [p-chlorophenyl p-chlorobenzenesulphonate] in wettable powders and Metacide [6·2 per cent. parathion, 24·5 per cent. methyl-parathion and 2·7 per cent. related organic phosphates] in an emulsion concentrate were each applied in the laboratory in sprays at concentrations of 75, 100 and 125 mg. actual toxicant per litre water to eggs 1, 2 and 3 days old. The results

* The names isodrin and endrin have been adopted by the U.S. Interdepartmental Committee on Pest Control [*cf. R.A.E.*, A **41** 1] subsequent to the publication of the definitions of aldrin and dieldrin already noticed [**41** 2]. Isodrin is defined by the Committee as 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo-endo-dimethanonaphthalene and endrin as 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-endo-endo-dimethanonaphthalene, the names are applied to the pure chemicals, and it is stated that they are the endo-endo isomers of the compounds of which aldrin and dieldrin are, respectively, the endo-exo isomers. This statement would appear to restrict the application of the names aldrin and dieldrin to preparations comprising not less than 95 and 85 per cent., respectively, of the endo-exo isomers of the chemicals cited in their definitions instead of preparations containing similar proportions of any isomer or mixture of isomers of these chemicals—*Ed.*

were expressed as an angular transformation of the egg mortalities. There were four replicates of each experiment, and the variation between means for replicates was significant, emphasising the need for a more careful study of the biology of the eggs and the adults that lay them. Metacide was much more effective than the other materials and caused high mortalities, particularly at the higher concentrations. It was most effective against the older eggs. Statistical analysis showed that the differences between the ages of the eggs and the concentrations of Metacide were significant and that there was a significant interaction between them.

It is concluded that Metacide may be of value in field control of *H. armigera*; there was no indication in field tests that any of the materials had a deleterious effect on the plants or on the quality of the harvested sweet maize.

Bray (D. F.). **Life History and Control of** *Cinara winonkae*.—*J. econ. Ent.* **46** no. 1 pp. 103–107, 14 refs. Menasha, Wis., 1953.

Poor growth and death of Chinese arborvitae (*Thuja orientalis*) in many plantings in Delaware for several years before 1950 was found to be associated with the presence of Aphids on the roots. These were identified by Hottes as *Cinara winonkae* Hottes, about which little is known and which is considered by some authorities to be a synonym of *C. tujafilina* (Del G.), an Aphid that has been recorded from several conifers, including *Thuja*, in various parts of the United States [*cf. R.A.E.*, A **21** 46; **23** 383]. Since the types of *C. tujafilina* have been destroyed and *C. winonkae* differs in some respects from Del Guercio's figures and descriptions, the two are provisionally regarded by Hottes as distinct.

Observations showed that adult apterous viviparae and nymphs occurred on the roots of *Thuja* throughout the year. Apterae appeared on the tender bark of stems and branches in late February and alatae were present from mid-March until the first week in May. During May, nearly all disappeared, except in well-shaded areas, but apterae were again present on the stems from late September until early December and alatae occurred in October and November. No males, oviparae or eggs were observed. The Aphid was gregarious, both on the roots and on the stems and branches, congregating in cracks and similar places. It was almost always associated with ants, primarily *Lasius niger neoniger* Emery, which transport it between stems and roots. Infestation caused die-back of the roots and branches, but tests indicated that the Aphid did not secrete any material toxic to the plants.

Spraying in April 1950 with 2 lb. 15 per cent. wettable parathion, 4·lb. 50 per cent. wettable BHC (6 per cent. γ isomer) or 1·25 U.S. pints nicotine sulphate per 100 U.S. gals. at 200 U.S. gals. per acre gave 100, 99 and 94 per cent. reduction in population on the aerial parts of *Thuja* plants two years old, but did not destroy the Aphids on the roots. When injected to a depth of 4–7 ins. into the soil about the roots, 40 per cent. wettable chlordane and 25 per cent. wettable aldrin at 0·8 gm. per plant gave complete mortality on the roots, but BHC, 25 per cent. wettable dieldrin and 27 per cent. wettable EPN [O-ethyl O-p-nitrophenyl benzenethiophosphonate], injected in the same way, at 2·9 gm. per tree, and aldrin, BHC and chlordane applied to the surface of the soil at 0·56, 1·2 and 1·2 gm. after it had been dug to a depth of 9 ins. were less effective; aldrin and chlordane applied to the soil surface before irrigation, and DDT, BHC and chlordane injected to a depth of 1 in. gave no control. Roots of plants receiving the first chlordane treatment were still free from Aphids after 18 months; their condition was improved after five months, but had reverted

to that typical of infested ones after 18 months. Aphids were found on the stems during the periods of activity of the alatae, which may have accounted for the poor root condition. A 5 per cent. chlordane dust, thoroughly disked into the soil to a depth of 4 ins. at the rate of 100 lb. per acre in April 1951, a fortnight before the plants were set, gave complete protection from the Aphid for a year.

It is concluded that complete control necessitates treatment against the apterae on the roots and both forms on the stems and branches; since the alatae are present in spring and autumn, treatment must be applied at both seasons.

Parencia jr. (C. R.) & Ewing (K. P.). **Late-Season Control of Boll Weevil and Bollworm with Sprays and Dusts in 1950.**—*J. econ. Ent.* **46** no. 1 pp. 108–112, 1 ref. Menasha, Wis., 1953.

Several organic insecticides applied as low-volume sprays and as dusts were tested in small-plot and large-scale field experiments in Texas in 1950 against late-season infestations of *Anthonomus grandis* Boh. and *Heliothis armigera* (Hb.) on cotton. A large-scale experiment on treatment by aeroplane was carried out in the north of the State and the others in central Texas near Waco.

Dusts of 20 per cent. toxaphene and 40 per cent. sulphur, of 5 per cent. DDT and 40 per cent. sulphur with 10 per cent chlordane, 2·5 per cent. aldrin or enough BHC to give 3 per cent. γ isomer, of 2·5 per cent. dieldrin, or of 5 per cent. DDT with 5 per cent. heptachlor, applied 5–8 times at about 15 lb. per acre between late July and the beginning of September, were equally effective in controlling *A. grandis*. In one small-plot experiment, there was no significant difference in yield between plots dusted with the mixture of DDT, sulphur and either BHC or aldrin and those receiving sprays of 0·75 lb. DDT with 0·45 lb. γ BHC or heptachlor or with 0·375 lb. aldrin per acre, whereas in another, dusting with dieldrin or with toxaphene and sulphur gave significantly higher yields than spraying with 0·66 lb. each of DDT and heptachlor per acre; there was no significant difference in yield between the dieldrin dust and dieldrin at 0·33 lb. per acre in a spray.

In one small- and one large-scale experiment, the dust of toxaphene and sulphur gave better control of *A. grandis* and higher increases in yield than sprays applied to give 2·5–2·75 lb. toxaphene per acre, 0·625 lb. DDT with 0·375 lb. γ BHC or 0·31 lb. aldrin per acre, 0·67 lb. DDT with 0·33 lb. aldrin or dieldrin or 0·4 lb. γ BHC per acre or 0·31 lb. dieldrin per acre. Dieldrin at these rates did not give satisfactory control of *H. armigera*, and toxaphene was more effective against it as a dust than as a spray. In four large-scale experiments, aldrin applied in a spray 4–6 times in August gave better control of *A. grandis* and higher increases in yield at 0·375 lb. than at 0·25 lb. per acre; DDT was included in each spray against *H. armigera*.

When applied by aeroplane in July–September, two spray applications of 0·375 lb. aldrin followed by 13 of 0·375 lb. each of aldrin and DDT per acre gave significantly better control of *A. grandis* and a significantly higher yield than toxaphene at 2·25 lb. in the first two and 3 lb. in the last 13 applications.

Hintz (H. W.). **Laboratory Tests of Acaricides on Eggs of European Red Mite.**—*J. econ. Ent.* **46** no. 1 pp. 112–115, 1 graph, 3 refs. Menasha, Wis., 1953.

In the tests described, which were carried out in Ohio in 1951, 11 formulations were tested against the winter eggs and 13 against the summer

eggs of the European red mite [*Paratetranychus pilosus* (C. & F.)]. The amounts of toxicants given are per 100 U.S. gals. The winter eggs were sprayed 11 days before hatching began, and the percentages of viable eggs killed averaged 100 for 2·5 U.S. pints DN-289 (36 per cent. triethanolamine salt of dinoseb) and 5 lb. EPN-300 (27 per cent. wettable O-ethyl O-p-nitrophenyl benzenethiophosphonate), 99·2 for 10 U.S. pints Dimite (an emulsion concentrate containing 25 per cent. 1,1-bis(p-chlorophenyl) ethanol), 94·2 for 4 U.S. pints Systox (an emulsion concentrate containing 42 per cent. O,O-diethyl O-2-(ethylmercapto)ethyl thiophosphate [demeton]),and 99·7 for 10 U.S. pints 50 per cent. malathon emulsion concentrate, the other materials proving less effective. The corresponding percentages for the summer eggs averaged 92 for 4 oz. EPN-300, 94 for 2 lb. 15 per cent. wettable parathion, 94·4 for 2 U.S. pints of the malathon concentrate, 94·6 for 2 lb. Ovotran (50 per cent. wettable p-chlorophenyl p-chlorobenzenesulphonate), and 95·2 for 4 U.S. pints Genite (an emulsion concentrate containing 50 per cent. 2,4-dichlorophenyl benzenesulphonate), other materials again proving less effective.

The chemicals mostly acted by preventing hatching, but malathon showed true ovicidal effect at high concentrations in orchard tests. There was little difference between summer eggs 1–3 days old and those 5–6 days old in susceptibility to several of the compounds tested, but parathion was more effective against the older eggs.

Manglitz (G. R.) & Cory (E. N.). **Biology and Control of** *Brevipalpus australis*.—*J. econ. Ent.* **46** no. 1 pp. 116–119, 8 refs. Menasha, Wis., 1953.

A mite identified as *Brevipalpus australis* (Tucker), which is polyphagous and widely distributed throughout the world, was observed feeding on orchids of several species at College Park, Maryland, in 1946 and has since become a potentially serious pest of orchids in other parts of the United States. The mites occurred mostly on the lower surfaces of the leaves and caused the appearance of silvery and sunken areas.

In rearing experiments, the egg, larval, protonymphal, deutonymphal and adult stages average 9·1, 6, 4·1, 7 and 25 days, respectively. Raising the temperature reduced the duration of the egg stage, and raising the relative humidity increased the percentage hatch. Parthenogenesis was observed and probably occurs in a large proportion of the females, as males were very rare. The adults were the most active. The preoviposition period averaged 3·8 days, and eggs were laid singly and at random on the leaves, usually on the lower surfaces. Sprays of proprietary mixtures of pyrethrum and rotenone and of ethyl phosphates gave some control, but had less immediate or residual effect than Dimite (1,1-bis(p-chlorophenyl)ethanol), which gave high initial mortality when applied to infested *Dendrobium* plants; no living mites could be found a week after treatment. This material was later successfully used for large-scale greenhouse treatments and caused no damage to orchids of several genera.

Jefferson (R. N.) & Mack (G. E.). **Control of certain Greenhouse Insects and Mites with Tetraethyl Dithiopyrophosphate Smokes.**—*J. econ. Ent.* **46** no. 1 pp. 120–123, 1 ref. Menasha, Wis., 1953.

Smoke generators containing 15 per cent. tetraethyl dithiopyrophosphate have been shown to be about as effective as 5 per cent. aerosols of the same compound against certain pests of flowering plants, and the results are here

given of tests of them against various mites, Aphids and Coccids on glasshouse plants in California. In general, the smoke was applied four times at 3–4 day intervals against mites and Coccids, with a second series of four applications beginning 2–3 weeks after the end of the first against certain scale insects. Only one application was made for the control of Aphids. Applications were usually made in the late afternoon, and the glasshouse remained closed overnight.

The smoke proved effective against *Planococcus* (*Pseudococcus*) *citri* (Risso), *Pseudococcus adonidum* (L.), *P. maritimus* (Ehrh.), *Phenacoccus gossypii* Tns. & Ckll., *Aonidiella aurantii* (Mask.), *Hemiberlesia lataniae* (Sign.), *Pinnaspis aspidistrae* (Sign.), *Coccus hesperidum* L., *Saissetia hemisphaerica* (Targ.) and *S. oleae* (Bern.) and the mites, *Tetranychus bimaculatus* Harvey, *Aceria paradianthi* Keifer and *Hemitarsonemus latus* (Banks) on various plants, but not against *Tarsonemus pallidus* Banks or strains of *Tetranychus bimaculatus* that had developed resistance to parathion and tetraethyl-dithiopyrophosphate aerosols two years previously. Control of Aphids was effective, but material was not secured for identification. More than 140 species of greenhouse plants were treated without injury. Papaya and carnation and *Cattleya* flowers were damaged, but injury to the last two was avoided by airing 2·5–3 hours after treatment was begun.

Scales (A. L.), Ivy (E. E.), Gaines (J. C.) & Rainwater (C. F.). **EPN for Cotton Insect Control.**—*J. econ. Ent.* **46** no. 1 pp. 130–133, 5 refs. Menasha, Wis., 1953.

The following is based on the authors' summary of this account of work in 1950 and early 1951 with dusts and sprays of EPN (O-ethyl O-p-nitrophenyl benzenethiophosphonate) and other toxicants against insects and mites that attack cotton in Texas. Comparative tests in field cages, in the greenhouse and in the laboratory indicated that EPN was effective at relatively low doses against *Anthonomus grandis* Boh., *Alabama argillacea* (Hb.), *Estigmene acraea* (Dru.) and the mites, *Septanychus texazona* McG. and *Tetranychus bimaculatus* Harvey. It did not appear outstandingly effective against *Heliothis armigera* (Hb.) or *Aphis gossypii* Glov. Parathion was not tested against *E. acraea*, but was more effective than EPN against all the other species except *Anthonomus*.

The results indicate that EPN is a promising material for use against cotton pests. A dosage of 0·3 lb. technical EPN per acre in a dust gave control of *Anthonomus* comparable with that from 2 lb. technical toxaphene or 10 lb. calcium arsenate, and at the same rate it would probably be very effective against *Alabama* and the mites and might give more than 50 per cent. kill of *Aphis gossypii*, which should be adequate. The lack of effectiveness against *Heliothis* would necessitate the addition of a minimum of 0·5 lb. technical DDT per acre to dusts or sprays applied for the control of general infestations on cotton.

Young (M. T.) & Gaines (R. C.). **Tests of Insecticides for Control of Cotton Insects.**—*J. econ. Ent.* **46** no. 1 pp. 133–136. Menasha, Wis., 1953.

The results are given of tests with calcium arsenate and various organic insecticides against insects on cotton at Tallulah, Louisiana, in 1951. Dosages are shown (in brackets) as lb. insecticide or mixture of insecticides per acre. In plots in which the cotton was planted on 10th–15th April and *Anthonomus grandis* Boh. was the most important pest, *Tetranychus*

bimaculatus Harvey becoming sufficiently numerous to cause defoliation late in the season and *Heliothis armigera* (Hb.) and *Aphis gossypii* Glov. being of little importance, about 8–9 effective applications were made in June–August. A 20 per cent. toxaphene dust (2·4) and sprays of aldrin (0·33) and dieldrin (0·22) gave satisfactory control of *Anthonomus*, whereas a toxaphene spray (2·4) was less effective. The toxaphene spray and dust gave the greatest reduction of the mite, and a spray of dieldrin and DDT (0·19 : 0·65) caused an increase in population. Sprays of aldrin and dieldrin gave better control of *Heliothis* with DDT (0·31 : 0·62 and 0·19 : 0·65, respectively) than without it. The toxaphene dust and aldrin sprays gave the greatest increase in yield. In comparisons of dusts, endrin (Compound 269) [*cf. R.A.E.*, A **41** 268, note] (9) gave no control of *Heliothis* and little of *Anthonomus* or the mite, but alternate applications of calcium arsenate (10) and a mixture of 5 per cent. DDT, 3 per cent. γ BHC and 40 per cent. sulphur (10), which were moderately effective against both insects and good against the mite, gave greater increases in yield than 5 per cent. DDT with 1·5 per cent. dieldrin (9) or with 2·5 per cent. aldrin (10), which was ineffective against the mite. Mite control was much improved by the addition of 40 per cent. sulphur to the dieldrin and aldrin mixtures and was also somewhat better when 0·5 per cent. parathion or 4 per cent. Aramite [2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite] was added to them, but the yield increases were still not as great for dieldrin, owing to scorching. A dust of 2·5 per cent. heptachlor with 40 per cent. sulphur (12) was very promising against all pests.

In plots in which the cotton was planted in early May but did not come up until mid-June, *H. armigera* caused severe damage and the other pests were unimportant; about seven effective applications were made in August–September. Dusts of lime-free calcium arsenate with 2·5–5 per cent. DDT and 1–0·5 per cent. parathion (8–14), 5 per cent. DDT and 3 per cent. γ BHC, alone or with oil, 40 per cent. sulphur or 4 per cent. Aramite (10–12), and 10 per cent. DDT with 6 per cent. γ BHC (7) all controlled *A. grandis* and reduced injury by *H. armigera*. Yields were highest in plots treated with 10 per cent. DDT with BHC and lowest in those receiving calcium arsenate, DDT and parathion. Dusts of 20 per cent. toxaphene, alone or with sulphur, Aramite or 0·5 per cent. parathion (12) gave better control of *H. armigera* and higher yields than 10 per cent. toxaphene with 2 per cent. parathion (11) or than 3 per cent. EPN [O-ethyl O-p-nitrophenyl benzenethiophosphonate] (13), but all controlled *A. grandis*. The dust mixture of DDT, BHC and sulphur and sprays containing γ BHC and DDT (0·33 : 0·55), heptachlor and DDT (0·36 : 0·72) or toxaphene and parathion (2·9 : 0·7) all gave satisfactory control of *A. grandis* and *H. armigera* and high yields. Sprays containing EPN (0·42) and toxaphene and parathion (2·6 : 0·2) were effective against *A. grandis* but less so against *H. armigera*, and gave less increase in yield.

KNUTSON (H.). **Susceptibility of a normal and an inbred Strain of *Drosophila melanogaster* to Dieldrin, Toxaphene, DDT, and Methoxychlor.**—*J. econ. Ent.* **46** no. 1 pp. 137–141, 1 graph, 18 refs. Menasha, Wis., 1953.

Drosophila melanogaster Mg. is being used as a test insect for the evaluation of insecticides and for studies of the genetic factors concerned in the development of resistance to them, but little is known of the effect of inbreeding on its susceptibility. In the tests described, males and females of a normal strain reared from wild flies from Rhode Island and a strain inbred by brother-sister matings for 12 generations were exposed to deposits

of DDT, methoxy-DDT (methoxychlor), toxaphene and dieldrin from acetone solutions in glass vials for periods that would be expected to give less than 100 per cent. kill and subsequently observed for mortality. Each sex of the inbred strain was more susceptible to toxaphene, DDT and methoxychlor and less susceptible to dieldrin than the same sex of the normal one, and the relative susceptibility of the two sexes varied considerably in both strains, the differences between sexes being greatest for methoxy-DDT. Males were more susceptible than females in all tests except those in which the normal strain was exposed to toxaphene. There were also variations between strains and sexes in the times after exposure required for average maximum mortality and complete mortality, though the latter was seldom reached.

Burrage (R. H.) & Gyrisco (G. G.). **Control of European Chafer Damage in Pasture Sod—II.**—*J. econ. Ent.* **46** no. 1 pp. 142–146, 3 figs., 1 ref. Menasha, Wis., 1953.

Examination in October 1952 of pasture plots in New York that had been dusted with various soil insecticides in September 1949 for the control of larvae of *Amphimallon majalis* (Razoum.) [*R.A.E.*, A **40** 241] showed that 1 lb. aldrin or dieldrin or 10 lb. DDT per acre had given almost complete control of four consecutive generations; BHC at 2 lb. γ isomer per acre did not control the fourth. In plots dusted with 8 lb. toxicant per acre on 8th April 1950, examination at intervals up to October 1952 showed that chlordane and γ BHC gave excellent control of four consecutive generations, whereas parathion gave highly significant control of two generations, about 55 per cent. of the third and none of the fourth. In July 1950, chlordane, aldrin and heptachlor were applied to pasture at 2 lb., BHC at 2 lb. γ isomer and DDT at 5 lb. per acre in 40 U.S. gals. emulsion spray from low-pressure, low-volume sprayers, and examination up to October 1952 showed that aldrin and heptachlor gave good control of three generations and BHC and DDT of one, whereas chlordane was ineffective.

DDT, aldrin, dieldrin, and possibly heptachlor appeared to be the most effective of the insecticides tested, but the last three should not be used where root or tuber food crops are to be grown in rotation with the sod, as they might be absorbed by them. Autumn dust treatments were more effective than summer sprays, but low-pressure, low-volume sprays are more economical to apply than dusts.

Potts (S. F.) & Spencer (R. A.). **Air-blast Spraying Apparatus for Helicopters.**—*J. econ. Ent.* **46** no. 1 pp. 147–150, 3 figs. Menasha, Wis., 1953.

Helicopters are more suitable than aeroplanes for spraying against insects that require heavy dosages and complete coverage for control, but their use has been restricted by high initial cost, low spray capacity (50–60 U.S. gals.) and the lack of a suitable apparatus for distributing a finely atomised spray. The normal boom attachment has nozzles that produce droplets 125–180 μ in diameter on an aeroplane travelling at 60–100 miles per hour, but of 200–300 μ on a helicopter, owing to the reduced wind action at the lower speed.

The authors describe an apparatus in which the air from the cooling fan of the helicopter motor is used to atomise the spray mixture; it provides much finer atomisation at delivery rates up to 12 U.S. gals. per minute with continuous agitation of the spray material in the tanks and permits the

application of suspension sprays by the use of nozzles with a large orifice. It is light in weight, and requires fewer nozzles, and spray drip is prevented by the continuous air blast and an instantaneous shut-off valve. It should give the best results when the optimum range of droplet diameters required is 40–60 μ.

The air blast from the cooling fan is adequate to atomise sprays from small nozzles mounted on the rim of the outlet, but the exhaust gases are used to assist in producing the higher velocity needed for large nozzles. Severe flash tests showed that this procedure is safe for emulsion or suspension sprays containing 50 per cent. or more water and for oil solutions if the oil has a viscosity exceeding 44 secs. Saybolt. For inflammable mixtures of kerosene and xylene, only the air from the cooling fans should be used. The apparatus was employed successfully throughout a season in the United States against pests of forests and cranberry bogs, and also against mosquitos.

An arrangement is also described for applying dusts and sprays simultaneously from a helicopter by coating the dust with the spray liquid. Such a method of application is useful when two or more materials are not stable or compatible in the same spray mixture.

Dorman (S. C.) & Hall (W. E.). **An improved Spray Tunnel Method for Laboratory Tests.**—*J. econ. Ent.* **46** no. 1 pp. 151–153, 6 figs., 3 refs. Menasha, Wis., 1953.

In the apparatus described, a horizontal wind tunnel 36 ins. long and 6 ins. in diameter has a spray nozzle of the air-brush type at one end and leads into a fume hood at the other. The pressure from the spray nozzle is used to provide a constant velocity of air in the tunnel, and the fume-hood door is left open, so that it merely carries away residual spray. Insects as small as Aphids or as large as cockroaches are exposed in a copper mesh cage, which is fixed to an axle just outside the tunnel at the hood end and revolves, so that all sides of the insects are uniformly sprayed. Mite-infested bean plants with two leaves are prepared by pinning the leaves up to expose the mites, and the pot is arranged so that the leaves are in the spray at the hood end of the tunnel; it may be rotated on a turntable during spraying.

In a series of comparative tests, lethal doses can be obtained by varying either the concentration of the spray or the volume sprayed. The arrangement described is probably best adapted to spraying a constant small volume of 0·3–0·5 ml. and determining a median lethal concentration after a fixed time. If organic solvents are used, a small volume is desirable because of the possible toxicity of the solvent; comparisons of equal amounts of toxicant sprayed in different volumes of carrier showed little difference in mortality in most cases, indicating that this is primarily a function of the toxicant and not the carrier. A carrier of the kerosene type is preferred if the compound to be assayed is sufficiently soluble in it. For comparison, tests are made with the carrier alone and with a standard toxicant, such as parathion or DDT, which should preferably be of the same type as that being investigated. Tests with solvents differing in volatility showed that the weight of deposit decreased as the volatility of the solvent increased, but that the toxicity was little affected; this suggests that the finer droplets are more efficient, owing to their higher concentration of toxicant, or that the deposit of fine droplets round edges and fine appendages is a stabilising factor and contributes more to toxicity than is recognised. The use of the air-brush nozzle and the elimination of large droplets by the horizontal

tunnel resulted in droplets of which 98 per cent. were between 0·25 and 4 μ in diameter.

The results obtained corresponded satisfactorily with field practice, provided that the physical and chemical properties of the toxicants were adequately known and effectiveness was expressed as a function of another compound of known field usefulness. The method permits a wide range of toxicity to be accurately and efficiently assayed. The results are not sensitive to operating variables, and insects and compounds of many kinds can be tested in the same machine.

Fleschner (C. A.) & Ricker (D. W.). **An Empidid Fly predaceous on Citrus Red Mites.**—*J. econ. Ent.* **46** no. 1 p. 155, 2 refs. Menasha, Wis., 1953.

An Empid identified as *Drapetis micropyga* Mel. frequently occurs in large numbers on *Citrus* trees in southern California and preys on *Paratetranychus* (*Metatetranychus*) *citri* (McG.), sometimes considerably reducing field populations of that mite.

Calhoun (S. L.) & Dunnam (E. W.). **Heptachlor and other Insecticides for Control of Cotton Pests.**—*J. econ. Ent.* **46** no. 1 pp. 157–158. Menasha, Wis., 1953.

Because of favourable preliminary results, field experiments were carried out in 1951 at Stoneville, Mississippi, to determine the minimum dosage of heptachlor necessary for the control of *Anthonomus grandis* Boh. and its effect on other insects and mites on cotton. Dusts were applied with tractor equipment seven times at intervals of about five days from 12th July until 16th August, and 2·5, 3·5 and 5 per cent. heptachlor, applied at rates of 0·26, 0·33 and 0·4 lb. toxicant per acre, respectively, 2·5 per cent. aldrin and 1·5 per cent. dieldrin, at 0·16 and 0·13 lb. toxicant, respectively, and an impregnated dust of BHC (3 per cent. γ isomer) at 0·29 lb. toxicant per acre all gave excellent control of *A. grandis*, with no significant differences between them. A 10 per cent. DDT dust was applied on 4th and 15th August to control *Heliothis armigera* (Hb.), which was by then increasing on all plots. Emulsion sprays were applied with tractor equipment 11 times at intervals of 5–7 days from 11th July until 4th September, DDT at 0·5 lb. per acre being included in each application from 2nd August until 4th September against *H. armigera*. Heptachlor applied at 0·25, 0·35 and 0·5 lb. per acre and aldrin, dieldrin and chlordane at 0·25, 0·15 and 1 lb. per acre, respectively, all gave similar high control of *A. grandis*. Aphids [*Aphis gossypii* Glov.] became numerous on all the sprayed plots late in the season, probably owing to the extensive use of DDT against *H. armigera*, but did not require control.

All treatments resulted in considerable increases in yield, and appeared to have little effect on mites, and it is concluded that heptachlor at 0·25 lb. per acre in either dust or spray is sufficient for the control of *Anthonomus*.

Shaw (F. R.), Bourne (A. I.) & Boyd (W.). **Incidence of Forage Crop Pests in Massachusetts and seasonal History of the Meadow Spittlebug.**—*J. econ. Ent.* **46** no. 1 pp. 159–160. Menasha, Wis., 1953.

Surveys of injurious insects present in lucerne and clover fields in the Connecticut Valley and elsewhere in Massachusetts were made at intervals

in May–July 1952. Nymphs of the meadow spittlebug [*Philaenus leucophthalmus* (L.)] were small and rare on 5th May, but common on 18th-22nd May and 3rd–5th June. Some adults were found on 11th June, 70 per cent. of the population was adult on 18th June, and only adults were present on 8th July, indicating that the immature stages were completed in about a month. Migration was observed from mature uncut lucerne to newly sown lucerne. Other injurious insects found are shown in a list, and the fluctuations in population of some of them are briefly discussed.

Hetrick (L. A.) & Moses (P. J.). **Value of Insecticides for Protection of Pine Pulpwood.**—*J. econ. Ent.* **46** no. 1 pp. 160–161. Menasha, Wis., 1953.

In the spring of 1952, pine trees (*Pinus taeda*, *P. caribaea* and *P. palustris*) were felled for pulpwood in Florida. They were cut into logs and piled in stacks about 120 cu. ft. in size near the forest, and these were treated with insecticides for protection against insects, mainly species of *Ips* and sawyer beetles. Emulsion sprays containing 0·5 per cent. aldrin, dieldrin, endrin, isodrin [*cf. R.A.E.*, A **41** 268, note], BHC, chlordane, heptachlor, toxaphene and a mixture of toxaphene and BHC (1 : 1) were applied at 3 U.S. gals. per stack within a few hours of felling, and log samples were examined four weeks later. All treatments gave some protection from infestation, and dead beetles were found in all the piles. Predators, including *Temnochila virescens* (F.), and parasites were also killed. BHC gave the best protection (an average of 0·02 insect entries per sq. ft. of bark surface), and toxaphene and chlordane the least (1·6 and 1·9 per sq. ft.). Untreated logs had more than ten entries per sq. ft.

van den Bosch (R.). *Bathyplectes curculionis* **as a Parasite of** *Hypera brunneipennis*.—*J. econ. Ent.* **46** no. 1 pp. 161–162, 7 refs. Menasha, Wis., 1953.

Hypera brunneipennis (Boh.), which was first observed in the United States in Arizona in 1939 [*cf. R.A.E.*, A **28** 120], had spread to the Imperial and Coachella Valleys of California by 1949 and to the coast (San Diego County) by 1950. Wild clovers at first appeared to be its preferred food-plants in California, but more recently it has damaged lucerne and appears to be increasing in importance on that crop. Parasites identified as *Bathyplectes curculionis* (Thoms.) were found associated with the weevil on wild clover and lucerne in San Diego County in the spring of 1952 and were later reared from other examples. This Ichneumonid is an important parasite of *H. variabilis* (Hbst.) (*postica* (Gylh.)) in the central coast area of California [*cf.* **33** 41] and was not known to occur so far to the south. It proved to be well adapted to *H. brunneipennis* and was widespread in San Diego County. It has not been recovered from the weevil in the Imperial Valley and is not believed to be established there. Attempts are to be made to introduce it, in spite of a previous failure in Arizona [*cf.* **36** 55].

Lange jr. (W. H.). *Aceria parthenii* **Keifer, a new Eriophyid Mite injurious to Guayule.**—*J. econ. Ent.* **46** no. 1 pp. 162–163, 1 fig., 1 ref. Menasha, Wis., 1953.

An Eriophyid found damaging guayule (*Parthenium argentatum*) in a greenhouse in the Salinas Valley of California in July 1952 was subsequently

described by Keifer (1952) as *Aceria parthenii*, sp. n. It was not found on the plant in the field. The mites occurred on the buds, flowers, leaves and stems and caused severe distortion of individual leaves, poor branching, a reduction in the number of flowers and failure to set seed. The damage interfered with hybridisation studies and was most noticeable on glabrous-leaved hybrids; plants with an abundance of leaf hairs showed less distortion. Applications of 10 per cent. parathion in acetone as an aerosol at the rate of 70 ml. per 3,500 cu. ft. once every three weeks and of double this dosage had no effect on the mite, but dusting with sulphur three times at intervals of three days was very effective. Other materials tested were dusts of 7·5 per cent. p-chlorophenyl p-chlorobenzenesulphonate (Ovotran) and 1 per cent. tetraethyl pyrophosphate and sprays of 2 per cent. summer oil emulsion or lime sulphur (1:50); the lime-sulphur spray was the best of these, but was more difficult to apply than dusting sulphur.

Brown (E. E.). **Life Cycle of Lesser Apple Worm in northeastern Oregon.** —*J. econ. Ent.* **46** no. 1 p. 163. Menasha, Wis., 1953.

Cydia (*Grapholitha*) *prunivora* (Walsh) is a major pest of stone fruits, particularly cherries and prunes, in an important area in Oregon. Laboratory and field investigations carried out since 1949 showed that winter is passed by the fully fed larvae in cocoons in the débris on the ground. Pupation occurred about mid-April, and the adults emerged after 14–18 days, in late April or early May, and were present for 3–4 weeks. The eggs of the first generation were deposited on cherry or prune leaves, the former being preferred, and hatched in 7–12 days. The larvae fed in the small fruits for 18–24 days and then dropped to the ground to pupate, and the prepupal and pupal stages lasted about 3–4 and 12–16 days, respectively. The adults emerged in late June or early July and were present for 28–38 days. The eggs of the second generation were laid on prune rather than on cherry, and mainly on the fruits, though some were found on the leaves. They hatched in about five days, and the larvae entered the fruits immediately and fed in them for 18–24 days. The first to drop from the fruits gave rise to adults about 7–20 days after the end of the summer moth flight; these adults were present for 12–29 days and deposited a few eggs, but none of them gave rise to larvae that overwintered. The remainder of the larvae that dropped from the fruits in August spun cocoons and overwintered.

Swain (R. B.). **Effect of Benzene Hexachloride on Coffee Flavor in Nicaragua.**—*J. econ. Ent.* **46** no. 1 p. 167, 1 ref. Menasha, Wis., 1953.

In July–November 1951, green and ripening fruits of coffee were severely injured by the Tettigoniid, *Idiarthron atrispinum* (Stål) in the mountains south of Managua, Nicaragua, and insecticidal dusts [*cf. R.A.E.*, A **41** 217], several of which contained BHC, were applied for its control. To test the effect of heavy applications of this compound on the flavour of coffee beans, dusts containing 20 per cent. toxaphene, 3 per cent. BHC with 5 per cent. DDT, or 1·05 per cent. BHC with 1·75 per cent. DDT were applied at about 2 lb. per 25 trees six times between 7th August and 8th October. This rate was much higher than that used by most growers, which was 17–20 lb. per acre. The coffee was harvested on 3rd December and roasted, and tasting tests indicated that that from untreated trees and those dusted with toxaphene had a good flavour, whereas that from trees receiving BHC had an unpleasant one. It is therefore considered unwise

to use BHC on coffee in Nicaragua. The compound is reported to have affected the flavour of coffee in Kenya, but not in Brazil [*cf.* **39** 296].

Green (H. B.). **Peach Spraying—Airplane vs. Ground Application.**—*J. econ. Ent* **46** no. 1 pp. 168–169. Menasha, Wis., 1953.

Tests were carried out in 1952 to compare aeroplanes and ground equipment for the application of sprays against the plum curculio [*Conotrachelus nenuphar* (Hbst.)] on peach in Mississippi. An emulsion concentrate containing 8 lb. toxaphene per U.S. gal. was diluted to 1:100 for ground application, and a similar quantity of toxaphene was applied by aeroplane in 5 U.S. gals. emulsion spray per acre. Treatments were made during the mornings of 3rd, 16th and 29th April and 13th June. The aeroplane spray consisted of fairly large droplets and caused some scorching of the leaves. Examination of fallen and harvested peaches showed that treatment with ground equipment gave better control (1·91 and 1·09 per cent. infested fruits, respectively) than aeroplane application (8·66 and 3·69 per cent.), though analysis of leaf samples taken immediately after the last application showed heavier deposits of toxaphene from aeroplane treatments, particularly in the tops of the trees. There appeared to be no correlation between the amount of poison deposited and the degree of control obtained.

Hutchins (R. E.) & Langston (J. M.). **An unusual Occurrence of the Field Cricket.**—*J. econ. Ent.* **46** no. 1 p. 169. Menasha, Wis., 1953.

Unidentified field crickets became so abundant as to be a nuisance in the city of Greenville, Mississippi, in August 1951, and crickets that were identified as *Acheta assimilis luctuosus* (Serv.) were again very abundant in this and other towns in the State from about 1st to 20th August 1952; they were also recorded as being numerous in Arkansas. They appeared to be attracted particularly by fluorescent lights and mercury-vapour lamps and caused some damage in shops by attacking fabrics, especially those made of nylon. Crickets of the same species were reported as unusually abundant in Illinois during August 1952, but several varieties may have been involved.

These unusual outbreaks were associated with drought, but were probably not caused by direct lack of moisture. Populations may have increased abnormally because of dry weather and low incidence of fungous diseases. There were usually small numbers of grasshoppers among the crickets in the towns.

Farrar (M. D.) & Anderson (G. M.). **A new Pest of Blue Lupine.**—*J. econ. Ent.* **46** no. 1 pp. 169–170, 2 figs. Menasha, Wis., 1953.

Blue lupin (*Lupinus angustifolius*) has become an important soil-building crop in parts of south-eastern South Carolina and is sown between late September and February. Plants observed to be dying in 1950 were found to be infested by larvae of *Sitona explicitus* (Csy.), a weevil that has been taken on lupin in Texas, California, Alabama and Georgia, but has not hitherto caused economic damage. In three counties, damage occurred in most of the early-planted fields; the larvae were 0·06–0·33 in. long in February and March, and pupae were present in earthen cells 2–4 ins. below the soil surface in April and May. Adults were not found until mid-July, but were abundant from then until late September on the foliage of wild cherry and wild plum near infested fields. Adults brought into the laboratory fed and remained active for several months and readily resumed

activity after being kept in a refrigerator for three months. Eggs were deposited in lupin fields planted during autumn; no damaged plants or larvae were found in fields planted after 1st January. The larvae fed on the nitrogen-producing nodules of the roots, and injured roots were attacked and destroyed by fungi and bacteria.

Calhoun (S. L.) & Dunnam (E. W.). **Endrin for Control of Cotton Pests.** —*J. econ. Ent.* **46** no. 1 pp. 170–172. Menasha, Wis., 1953.

A mixed population of *Heliothis armigera* (Hb.) and *H. virescens* (F.) attacked cotton in the Mississippi Delta during the summer of 1951, and emulsion sprays of endrin [*cf. R.A.E.*, A **41** 268, note] were tested on late cotton, for control of these species and of *Anthonomus grandis* Boh. In the first test, in which emulsion sprays were applied with a tractor sprayer at 3 U.S. gals. per acre nine times at intervals of 4–6 days between 30th July and 4th September, endrin at 0·2 lb. per acre per application was as effective as a mixture of dieldrin and DDT, used at 0·2 and 0·5 lb., respectively, per acre against *A. grandis* and slightly more effective against *Heliothis* spp. In the second, endrin was applied from an aeroplane at 0·2 lb. in 1 U.S. gal. emulsion spray per acre seven times between 29th August and 5th October, the intervals between sprays increasing from four to nine days as the season progressed, and gave excellent control of both *A. grandis* and *Heliothis* spp. and increased the yield considerably. There was some indication of a reduction in Aphids [*Aphis gossypii* Glov.] and an increase in Tetranychid mites after treatment, but neither of these pests was of economic importance.

Morrison (F. O.). **Effect of Soil Treatment with BHC and Lindane on Barley Yields.**—*J. econ. Ent.* **46** no. 1 pp. 173–174, 5 refs. Menasha, Wis., 1953.

Investigations were begun in Quebec in 1948 to estimate the cumulative effect of BHC on plants grown in soil treated with it. In 1948, plots were watered with suspensions of a proprietary wettable crude BHC at dosages that were estimated as 0·25, 0·5, 1, 5, 20 and 60 lb. γ isomer per acre, but were probably 2·5 times as great, since the material proved in bioassay tests to contain 16 and not as claimed 6 per cent. γ BHC. They were sown with barley and gave yields of 30, 29·7, 31·1, 25·6, 4·4 and 0 bushels per acre, as compared with about 25–27 bushels from plots treated with water only. In 1949, the treatments were repeated on the same plots, except that the two highest dosages were not used, and the yields were 27·8, 27·7, 29·6, 18·9, 31·4 and 25·5 bushels per acre, as compared with 22–26 for water only. In 1950, the plots originally treated with estimated doses of 0·5, 5 and 20 lb. γ isomer in wettable crude BHC received 0·25, 5 and 20 lb. γ isomer per acre as lindane, that originally receiving the highest dosage was again left untreated, and the treatments estimated as 0·25 and 1 lb. γ BHC in wettable powder were repeated. The yields, in the original order, were 30·1, 26·7, 30·1, 30·2, 30 and 29·8, as compared with 28–31·5 for water only.

In 1948 and 1949, plants in the plots treated with the estimated 5 lb. γ BHC per acre were poor in colour early in the season, but indistinguishable from others later. Plants appeared normal in 1949 in plots treated with the estimated 20 or 60 lb. γ isomer in the previous year and in 1950 in all plots. Statistical analysis showed that in 1948, treatment with the estimated 0·25, 0·5 and 1 lb. γ BHC increased yields and treatment with

20 lb. decreased them, and that in 1949, the 20 and 60 lb. dosages of the previous year increased yield and had no residual effect, respectively, and repeated estimated dosages of 0·25 and 0·5 lb. caused an increase and those of 5 lb. a decrease just verging on significance. There were no significant differences in yield in 1950. No insect pests were present during the experiment.

It is concluded that the effects of BHC on plant growth are complex and influenced by soil and season and that many years of investigation will be required to elucidate them.

Dean (H. A.). **Long-horned Beetles that attack *Citrus* in the Lower Rio Grande Valley of Texas.**—*J. econ. Ent.* **46** no. 1 p. 174, 1 ref. Menasha, Wis., 1953.

After severe frosts in Texas at the end of January 1951, wood-boring Coleoptera were found to have entered many badly injured *Citrus* trees by way of the dead bark; some may have entered trees damaged by frosts in January 1949. Borers were seldom found in trees in good condition. The large borers were found at the junctions between the living and dead wood or just within the living wood and tunnelled towards the base of the tree. Removing infested branches gave the best control and was considered desirable as these were so weakened that they would have been broken by high winds. Ants were frequently found in the tunnels, one of the genus *Crematogaster* being the most frequent. The ants attacked the borers, but the latter crushed some of them with their mandibles. Larvae were removed from the trees and reared in the laboratory by a method that is described. Two species that bored into the heart of the large branches were identified as the Prionids, *Mallodon* (*Stenodontes*) *dasystomus* Say and *Archodontes melanopus serrulatus* (Lec.), and two that apparently tunnelled only in dead wood as the Cerambycids, *Eburia mutica* Lec. and *Romaleum taeniatum* Lec. Others taken from *Citrus* were *Chion* (*Cerasphorus*) *cinctus* (Dru.), *Amphicerus cornutus* (Pall.), *Elaphidion* sp. and *Chrysobothris* sp.

Corliss (J. M.). **Gypsy Moth Control Activities in the northeastern Region.** —*J. econ. Ent.* **46** no. 1 p. 175. Menasha, Wis., 1953.

Effective control of the gipsy moth [*Lymantria dispar* (L.)] in the north-eastern United States [*cf. R.A.E.*, A **33** 238, etc.] involves the collection of female pupae to obtain sex-attractant material for use in traps [*cf.* **39** 14] and extensive surveys with such traps to determine areas of general infestation, scouting surveys to delimit individual infestations and make recommendations for spraying, and the application of insecticides while the larvae are present.

The female pupae are collected in heavily infested areas, formerly in New England, but more recently also in Europe, owing to local scarcity. The survey traps are set out in the field by early July, before the male moths emerge, and removed in late August or early September. Scouting surveys are made in autumn and winter in the areas in which males were caught, in areas previously known to be infested and in localities in which infestation might occur through the carriage of egg-masses or larvae by vehicles, and these provide a basis for planning spraying operations.

Since 1946, DDT has been the insecticide mainly used against the larvae. It is most effective when 1 U.S. gal. of 12 per cent. DDT in oil is distributed per acre, and is applied from aeroplanes or mist blowers in spring. Aeroplanes are used for spraying woodland, after precautions have been taken

to avoid contaminating water supplies, fish hatcheries and market gardens and to prevent injury to farm animals. Mist blowers are used primarily to eliminate any infestations caused by carriage.

Operations in 1951–52 are summarised. Female pupae were collected in New England and Portugal or reared in the laboratory, and traps were operated in New Jersey, New York, Pennsylvania and all the New England States. Tests showed little difference in the effectiveness of traps baited with extracts of 12, 14 or 16 abdominal tips, and no deterioration in hydrogenated material [*cf.* **33** 239] after storage for several years. The traps were most effective when situated along natural flight channels in wooded growth; those set in the open were less dependable. Scouting surveys were made in Connecticut, New Jersey, New York, Pennsylvania and Vermont. No infestation was found in New Jersey, and sprays were applied in the other four States and Massachusetts.

As a result of the work, progress is being made in eradicating *L. dispar* in Pennsylvania, eliminating areas of general infestation in New York, reducing the intensity of infestation in western New England and preventing the westward spread of the moth.

Brett (C. H.). **Southern Cornstalk Borer Control with Methoxychlor, DDT, Isodrin and Endrin.**—*J. econ. Ent.* **46** no. 1 p. 176. Menasha, Wis., 1953.

Diatraea crambidoides (Grote) is one of the most destructive pests of maize in many areas of the southern United States. The larvae feed on leaves in the whorl, making them ragged, and bore down into the tap-root to overwinter. There are two generations a year in North Carolina. Delayed planting to avoid damage by the first generation has given some control; insecticides have generally been ineffective.

In a test in 1952, sweet maize planted on 13th August was sprayed with DDT, methoxy-DDT (methoxychlor), isodrin or endrin [*cf. R.A.E.*, A **41** 268, note] on 26th August, 3rd, 9th, 16th and 30th September and 7th October and examined for infestation on 28th October. Each insecticide was used at the same rate in all applications, but in 25 U.S. gals. liquid per acre in the first four and in 50 U.S. gals. in the last two. Plants treated with 1 lb. DDT or methoxy-DDT per acre showed 38 and 52 per cent. of the stems tunnelled and 26 and 20 per cent. containing larvae, respectively, whereas plants treated with 0·5 and 0·25 lb. isodrin and 0·25 and 0·12 lb. endrin per acre showed 0, 2, 1 and 7 per cent. tunnelled stems, respectively, and none contained larvae. Untreated plants were completely destroyed by *D. crambidoides* and the fall armyworm [*Laphygma frugiperda* (S. & A.)]. Plants sprayed with 0·12 lb. endrin were the tallest and matured well, and this is considered the best treatment; those receiving the other treatments showed stunting, which may have been due to phytotoxicity of the insecticides, solvents or emulsifiers.

Ross (H. H.). **Another European Cherry Leafhopper in North America.**—*J. econ. Ent.* **46** no. 1 p. 177, 1 fig. Menasha, Wis., 1953.

Erythroneura flammigera (Geoffr.) was collected for the first time in North America on cultivated cherry in Vancouver, British Columbia, in August 1950. This Jassid feeds on a wide variety of shrubs and trees in Europe, but was not found on any other deciduous tree at Vancouver. The adults and male genitalia are briefly described.

Siegler (E. H.). **Soil Insecticides for Control of Woolly Apple Aphids on Nursery Stock.**—*J. econ. Ent.* **46** no. 1 pp. 177–178, 2 refs. Menasha, Wis., 1953.

In tests of soil treatments for the protection of nursery apple trees against *Eriosoma lanigerum* (Hsm.) in Virginia, dusts containing 10 per cent. DDT, toxaphene, chlordane, parathion, aldrin or dieldrin or 10 per cent. γ BHC with 66 per cent. other isomers were applied at 10, 20, 30 or 40 oz. per 25 ft. of row. In the first test, DDT, toxaphene, chlordane, parathion and BHC were applied by hand in the furrows in 1949, just before the seedlings were planted, and the trees were dug and examined in 1952. BHC killed all the trees treated with it, but no other material caused visible injury. Chlordane gave complete or almost complete protection at all rates, and toxaphene complete protection at the highest. Parathion proved moderately effective at all rates, and DDT at the two highest. In the second test, in 1950, DDT, chlordane, BHC, aldrin and dieldrin were applied to the surface of the soil as a band 4–6 in. wide on each side of several other rows of the same planting and covered with 1–2 in. of soil. None of the materials injured the trees, and there was practically no infestation when the trees were dug in 1952, except in plots treated with 10 or 30 oz. DDT or 40 oz. chlordane dust. As infestation by *E. lanigerum* is usually uneven in apple orchards, these results are not conclusive, but they suggest that soil treatment with organic insecticides is a promising method of control.

Poos (F. W.) & Bissell (T. L.). **The Alfalfa Weevil in Maryland.**—*J. econ. Ent.* **46** no. 1 pp. 178–179, 3 refs. Menasha, Wis., 1953.

Hypera variabilis (Hbst.) (*postica* (Gylh.)), which has been an important pest of lucerne in the west of the United States for nearly 50 years, was collected in Maryland, for the first time in the east, in July 1951. During 1952, it was also reported from Delaware, Virginia, New Jersey and Pennsylvania. A survey begun in April 1952 showed that 15 counties in Maryland were infested. In Baltimore and Harford Counties, the weevil was found in all the lucerne fields sampled and caused important damage. Adults were numerous on 17th and 30th April, and larvae were abundant and causing injury on the latter date. Cocoons were first observed on 19th May. Damage to lucerne was severe in June, when larvae and cocoons were numerous in some places. Adults were again collected on 16th July, and they readily oviposited in the insectary. The eggs hatched by 25th July, and the larvae had made their cocoons by 5th August; adults were emerging by 11th August. Collections were again made during August and September, and half-grown larvae collected on 8th September gave rise to adults in the insectary on 29th September. These results indicate that more than one generation developed in 1952.

In the insectary, the egg, larval-feeding and pupal stages lasted at least 7, 12 and 5 days, respectively. Cocoons were found near the tops of the lucerne plants as well as on the ground. It is concluded that the weevil may become economically important in Maryland and require control.

Milliron (H. E.). **A European Flea Beetle injuring Crucifers in North America.**—*J. econ. Ent.* **46** no. 1 p. 179. Menasha, Wis., 1953.

A flea-beetle described as *Phyllotreta columbiana* by Chittenden in 1927 from specimens collected in British Columbia in 1923 and since reported from other parts of North America, including Minnesota and Delaware [*cf.*

also *R.A.E.*, A **34** 75], has been found to be identical with the European *P. cruciferae* (Goeze). One of the preferred food-plants of the adults in the United States is wild mustard, and this may explain its rapid and extensive distribution inland from the coastal areas. *P. cruciferae* is an important pest of cultivated crucifers and causes severe damage when numerous. In 1951, it was abundant throughout Delaware on cabbage, cauliflower and broccoli as well as on kale, radish and turnip. Injury was most extensive and noticeable on cabbage, especially on the young plants.

Snapp (O. I.). **Aldrin and Dieldrin as Soil Insecticides to control Plum Curculio.**—*J. econ. Ent.* **46** no. 1 p. 180, 4 refs. Menasha, Wis., 1953.

Laboratory tests were made in Georgia in 1952 on the effectiveness of aldrin and dieldrin for the control of *Conotrachelus nenuphar* (Hbst.) while in the soil, so that the application of insecticides to peach trees could be avoided. On 2nd May, dusts containing 2·5 per cent. aldrin or 1·5 per cent. dieldrin were applied at the rates of 2 or 4 lb. toxicant per acre to pupation boxes containing soil to a depth of 6·5 ins. and worked into the upper 3 ins., and full-grown larvae were put in the boxes on 3rd-8th May. Adults first emerged on 31st May, and counts showed averages of 0·3 and 0·5 per cent. emergence, respectively, in soil treated with 2 and 4 lb. aldrin, 8·4 and 4·9 per cent. in that treated with 2 and 4 lb. dieldrin, and 67·9 per cent. in untreated soil. Some of the adults died before they could leave the soil and others soon after leaving it, and the survival percentages on 22nd July averaged 60 and 28·6 for 2 and 4 lb. aldrin, 80·6 and 55·4 for 2 and 4 lb. dieldrin, and 89·3 for no treatment.

Summers (T. E.) & Stafford (E. W.). *Diabrotica undecimpunctata howardi* **parasitized by** *Celatoria diabroticae*.—*J. econ. Ent.* **46** no. 1 p. 180. Menasha, Wis., 1953.

In the course of investigations on possible vectors of a virus disease of oats in the southern United States, large numbers of adults of *Diabrotica undecimpunctata howardi* Barber were found to be parasitised by *Celatoria diabroticae* (Shim.) [*cf. R.A.E.*, A **38** 425]. Almost 35 per cent. of 3,000 adults collected on oats in southern Mississippi in February and March 1951 and 19 per cent. of 1,000 collected during a similar period in 1952 were parasitised, and it is concluded that the Tachinid may give important control of *D. u. howardi* in that area.

App (B. A.) & Weaver (C. R.). **Benzene Hexachloride to control Meadow Spittlebug.**—*J. econ. Ent.* **46** no. 1 pp. 182–183. Menasha, Wis., 1953.

Experiments were carried out in Ohio in 1950–51 to compare aeroplanes with ground equipment for the application of BHC against *Philaenus leucophthalmus* (L.) on leguminous forage crops. In 1950, an aeroplane was used to apply BHC in a dust at 0·2 lb. γ isomer per acre and as an emulsion spray at 0·1 or 0·4 lb. γ isomer per acre, and a power sprayer to apply the emulsion spray and a BHC suspension at 0·2 lb. γ isomer per acre in 9 and 100 U.S. gals. water, respectively. Treatments were applied on 12th May and evaluated on 24th May and resulted in 62, 58·2, 100, 90·5 and 95·2 per cent. reduction in infested red-clover stems, respectively; the first two are considered unsatisfactory. In another test, a BHC dust applied by aeroplane on 8th May and the suspension and emulsion sprays applied

by ground equipment on 9th May, all at 0·2 lb. γ isomer per acre, gave 65·5, 95·7 and 97·1 per cent. reduction in infested stems and 78·6, 98·1 and 98·9 per cent. reduction in nymphs on 22nd May. In 1951, applications on 27th April of a dust and an emulsion spray (at about 2 U.S. gals. per acre) by aeroplane and two emulsion sprays, at 40 and 5 U.S. gals. per acre, by ground equipment, all at a dosage of 0·25 lb. γ isomer per acre, caused 10·2, 94·5, 97·7 and 100 per cent. reduction in infested red-clover stems and 31·1, 98·9, 99·6 and 100 per cent. reduction in nymphs on 16th May. In this test, the dust applied by aeroplane gave very poor control in spite of excellent weather conditions.

Roeder (K. D.). Ed. **Insect Physiology.**—9¼ × 6 ins., [1 +] xiv + 1100 pp., 257 figs., 107½ pp. refs. New York, N.Y., J. Wiley & Sons, Inc.; London, Chapman & Hall, Ltd., 1953. Price £6.

This critical discussion of the major trends in experimental research on the physiology of insects is by 15 contributors, each of whom deals with his own field and expresses his own conclusions. In general, it is based on the literature prior to early 1952, but some subsequent published work and some unpublished results are also included. Of its 32 chapters, five are devoted to the alimentary canal, digestion and nutrition; four to the blood, circulation, and the regulation of the internal environment; three each to the integument, the senses, flight, behaviour, and development and regeneration; two to respiration and to nerve and reflex activity; and one each to excretion, social behaviour, the biochemistry of muscle, and the function of hormones in moulting and metamorphosis. Subjects of special interest in economic entomology, dealt with at varying lengths, include the penetration of the cuticle by insecticides, the absorption of stomach poisons, and the effects of insecticides on metabolism, the heart and circulation, the alimentary tract and nerve activity.

Cotterell (G. S.). **Major Pests of Crops in Afghanistan: a preliminary Note.**—*FAO Plant Prot. Bull.* **1** no. 4 pp. 52–55. Rome, 1953.

Brief accounts are given of the climate, topography and main crops of Afghanistan, followed by notes on insect pests and diseases of plants there, based on observations during a four months' visit beginning in June 1952. The most serious pest of deciduous fruits is *Hyponomeuta padellus* (L.), which sometimes causes complete loss of crop. Almond and apple are the most severely attacked, followed, in order of decreasing importance, by plum, apricot and cherry, and the larvae also feed on willow, which is commonly planted along canals and irrigation ditches. There is one generation a year. The adults emerge in June–July, and the larvae hatch in 2–3 weeks but do not feed until the following spring; they are parasitised by numerous Hymenoptera. Infestation by *Cydia pomonella* (L.) [*cf. R.A.E.*, A **27** 575] is common wherever apples are grown, but is most severe in the north, mainly owing to overproduction and the accumulation of infested fallen fruits. The intensity of attack varies greatly, even in a single locality, and infestation on the trees was roughly estimated at 5–90 per cent. In the hotter areas, almonds are severely attacked and the crop reduced by Lepidopterous larvae tentatively determined as *Malacosoma* sp. Infestation occurs in spring and early summer, sometimes causing complete defoliation, and is especially prevalent in the south-west, where almonds are grown on a large scale for export. Severe losses of Persian and introduced varieties of muskmelon in hot regions in the west, north and south-east are caused by adults and larvae of a Coccinellid tentatively determined as *Epilachna dodecastigma* Muls., which skeletonise the leaves

and feed on the pericarp of the developing fruits; watermelons are not attacked. Melons are also attacked by a Trypetid, probably *Myiopardalis* sp., especially in areas in the south-west that have recently come under cultivation as a result of an irrigation project, where infestation in introduced and native varieties is very high. Attack on watermelons is less severe.

Larvae of an unidentified Noctuid cause considerable defoliation of sugar-beet in early summer in an area in Kataghan Province where this crop is intensively cultivated, but damage by later generations is slight. Cotton is infested by *Aphis gossypii* Glov., which is normally present in small numbers, though heavy sporadic and localised outbreaks may occur, and it is also thought that cotton may suffer small outbreaks of *Heliothis armigera* (Hb.) (*obsoleta* (F.)). Large plantations of *Populus alba* and, in drier situations, *P. euphratica* established throughout the country are damaged by an unidentified Longicorn where summer irrigation is irregular; Chrysomeloid larvae, possibly of the genus *Scelodonta*, caused severe damage in a plantation near Kabul.

The indigenous locusts, *Dociostaurus maroccanus* (Thnb.) and *Calliptamus italicus* (L.), severely injure wheat and other crops, and *Schistocerca gregaria* (Forsk.) periodically enters the western and south-western desert area from Persia and Pakistan, but is less harmful, though it may increase in importance with the development of irrigation projects in the south-west. *D. maroccanus* and *C. italicus* have one generation a year and breed in the steppe regions and foothills of the north, extending up to an altitude of 3,000 ft. Eggs laid in June and July in soil sparsely covered with vegetation hatch in spring, and the hoppers and fledgling adults migrate to cultivated areas. In May and June 1952, a few mature swarms of *S. gregaria* and fledglings from breeding areas in Persia entered the south-western and western desert areas, and one swarm from breeding areas in Pakistan and India had entered south-eastern Afghanistan by October. In 1951, swarms from Persia were more numerous, but caused little damage to crops.

An unidentified Vespid feeds on unscreened grapes and raisins in drying houses and on ripe pomegranates in the south-west, and causes losses amounting to 50 per cent. among grapes in vineyards. The local control method consists of introducing smoke into the nests, which are made in the mud brick walls of buildings and the mud walls that surround the orchards and over which the vines are trained, in the early morning before the wasps are active; this kills the adults, but many of the larvae survive.

Miller (P. R.) & Sasscer (E. R.). **Plant Diseases and Insects in the United States.**—*FAO Plant Prot. Bull.* **1** no. 4 pp. 56–57. Rome, 1953.

The insects dealt with in this survey include *Lepidosaphes destefanii* Leon., which was recorded for the first time in the United States in April 1952, on olive in Sonoma County, California. Preliminary surveys in other parts of the State indicate that it is confined to the district in which it was discovered. It has previously been reported from an oleaceous plant, *Phyllyrea media*, in Sicily and Greece [*cf.* also *R.A.E.*, A **30** 320].

Ling (L.). **International Plant Protection Convention: its History, Objectives and present Status.**—*FAO Plant Prot. Bull.* **1** no. 5 pp. 65–68. Rome, 1953.

An account is given of the historical background, the most important provisions and the status of the International Plant Protection Convention

of 1951 [*R.A.E.*, A **41** 128]. By 1st May 1952, it had been signed by the representatives of 37 governments. Four of the signatory governments indicated that ratification by them was not necessary. By the end of 1952, six others had ratified the agreement, and most of the rest were in process of doing so. Two non-signatory governments have adhered.

Outbreaks and new Records.—*FAO Plant Prot. Bull.* **1** nos. 5–6 pp. 75–76, 89–92. Rome, 1953.

G. A. H. Helson reports (p. 75) from New Zealand that *Dasyneura mali* (Kieff.) was accidentally introduced in 1950 with apple stocks from Holland. It was found in two nurseries in Palmerston North and one in Auckland and was thought to have been exterminated, but it appeared in another nursery in Auckland in October 1952 and in one in Palmerston North in November. He also states that the azalea leaf-miner, *Gracillaria azaleella* Brants, which was recently discovered in the North Island [*R.A.E.*, A **41** 217], has spread to Christchurch, in the South Island, where it was found in November 1952.

The U.S. Bureau of Entomology and Plant Quarantine announces first records in the United States of *Poliaspis pini* Mask. (p. 76) and *Platyedra vilella* (Zell.) (pp. 90–91). *Poliaspis pini*, which is known from conifers of several species in China and Japan [**13** 362; **22** 140], was found on *Pinus* sp. in Baltimore, Maryland, in October 1952, and *Platyedra vilella*, which occurs in Europe and south-western Asia, attacks numerous malvaceous plants and caused serious damage to cotton in northern Persia in 1932 [*cf.* **26** 249], was taken on hollyhock [*Althaea*] on Long Island, New York.

Jacks (H.) & Lamb (K. P.). **Glasshouse Tests of organic Insecticides against Aphids on Swedes.**—*N.Z. J. Sci. Tech.* **34** (A) no. 2 pp. 172–178, 3 refs. Wellington, N.Z., 1952.

Nicotine sulphate and 13 recently developed insecticides were tested under glasshouse conditions for contact action against *Myzus persicae* (Sulz.) and most of them against *Brevicoryne brassicae* (L.) on swedes in New Zealand. The materials were applied as sprays to infested plants in pots, and counts were made of the Aphids still alive 24 hours later. These numbers and, in some cases, the numbers of survivors after longer periods are shown for each material in tables. Spray quantities are per 100 gals.

It was found that 1 lb. Folidol (22·4 per cent. emulsifiable parathion) or Thiophos (15 per cent. wettable parathion) and 1 pint Hexone (15–20 per cent. miscible tetraethyl pyrophosphate) were highly effective against *B. brassicae*, and that 0·06–0·5 lb. Folidol, Thiophos, Midol T. 10 (an emulsifiable preparation containing 2·7 per cent. BHC (0·7 per cent. γ BHC), 4 per cent. azobenzene and 0·3 per cent. parathion), and Higam (25 per cent. wettable γ BHC as lindane), 0·25–1 lb. EPN-300 (27 per cent. emulsifiable O,O-diethyl O-p-nitrophenyl benzenethiophosphonate), 0·083–0·166 gal. nicotine sulphate, 0·5 gal. Midol 100 (an emulsifiable preparation containing 4 per cent. azobenzene, 0·4 per cent. rotenone and 2 per cent. pyrethrum extract (10 per cent. pyrethrum)), and 0·25–0·5 gal. Midol 100+ oil (a similar preparation with the addition of 5 per cent. mineral oil) were all highly effective against *M. persicae*. An emulsifiable preparation of 23 per cent. aldrin was effective against *M. persicae*, but not *B. brassicae*, at a concentration of 2 lb., and one of 24 per cent. dieldrin was effective against *M. persicae* at 0·5–2 lb. and *B. brassicae* at 2 lb.; Aramite (15 per cent. wettable 2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite) was ineffective against *M. persicae* at 2 lb. Both dieldrin and

Arathane (25 per cent. wettable dinitrocaprylphenylcrotonate), which was effective against *M. persicae*, injured the plants at concentrations of 2 and 3 lb., respectively. The numbers of Aphids on plants sprayed with the systemic insecticide, Pestox 3 (66 per cent. miscible schradan), which was effective against *M. persicae* at 0·25–1 lb. and against *B. brassicae* at 1 lb., and, to a less extent, on those sprayed with EPN-300, Thiophos and Higam continued to decrease for 96 or even 168 hours after treatment.

Clark (P. J.), Richards (E. L.), Taylor (G. G.) & Jacks (H.). **DDT and Arsenic Residues on Fruit.**—*N.Z. J. Sci. Tech.* **34** (A) no. 2 pp. 209–212, 3 refs. Wellington, N.Z., 1952.

The sprays used in the tests described, which were made in New Zealand in 1947–50, contained 0·05 or 0·1 per cent. wettable DDT, 0·1 per cent. DDT in an emulsified solution or 0·3 or 0·15 per cent. lead arsenate. Tomatos were given single applications of all sprays except 0·15 per cent. lead arsenate and were harvested 1–28 days later, beans were treated twice at an interval of 12 days with 0·05 and 0·1 per cent. DDT and the lead-arsenate sprays and were picked 7 or 16 days later, and apples were sprayed throughout the season with 0·05 per cent. DDT and the fruit harvested 14–28 days after the last treatment. In no case was the p,p′DDT residue above the official tolerance of 7 parts per million, but the residue of arsenic trioxide on tomatos and beans in most cases exceeded the limit of 1·5 p.p.m. fixed under the Food and Drug Regulations of 1946. The DDT residues decreased significantly on tomatos, but not apples, as the interval between treatment and harvesting increased; the results with beans were inconclusive. Residues left by the emulsified solution of DDT were much greater than those left by wettable DDT. It is concluded that sprays containing 0·1 or 0·05 per cent. DDT can be safely applied to fruit and vegetables to within two weeks of harvest. It is not advisable to apply lead-arsenate sprays to tomatos or beans, as the interval between spraying and harvesting is not always long enough to allow for sufficient weathering.

Clark (P. J.), Richards (E. L.), Taylor (G. G.) & Jacks (H.). **Note on D.D.T. Residues on Cabbages.**—*N.Z. J. Sci. Tech.* **34** (A) no. 2 pp. 226–227, 3 refs. Wellington, N.Z., 1952.

The residues remaining at harvest on cabbages treated with DDT for the control of *Pieris rapae* (L.) and *Plutella maculipennis* (Curt.) were further investigated in New Zealand in 1947 by a technique similar to the one previously used [*R.A.E.*, A **37** 175]. The plants received ten applications of dusts containing 1 or 2 per cent. p,p′DDT or sprays containing 0·05 or 0·1 per cent. wettable p,p′DDT between 17th February and 16th April, and the cabbages were harvested 14 and 21 days after the last application and the outer leaves discarded. The DDT was estimated colorimetrically and the data obtained were analysed statistically. The residues were significantly lower after 21 than after 14 days, significantly down on both dates for the 1 per cent. as compared with the 2 per cent. dust, and significantly lower after 14 days for the 0·05 per cent. spray as compared with the 2 per cent. dust. The analysis indicated that the amount of deposit is very unlikely to exceed the legal tolerance of 7 parts per million on more than 0·1 per cent. of the treated cabbages, even when a 2 per cent. dust is applied. All treatments gave adequate control, and a 1 per cent. dust and a 0·05 per cent. spray can therefore be recommended as effective and safe provided that they are not applied within 2–3 weeks of harvest.

Sy (M.). **Methodischer Beitrag zur Untersuchung der Frage nach der Bedeutung der II. Generation des Apfelwicklers** (*Carpocapsa pomonella* **L.).** [Contribution to Methods of investigating the Problem of the Importance of the second Generation of *Cydia pomonella*.]—*Z. PflKrankh.* **57** pt. 7–8 pp. 241–246. Ludwigsburg, 1950.

Some 1–10 per cent. of the first-generation larvae of *Cydia* (*Carpocapsa*) *pomonella* (L.) complete their development without overwintering and produce a second (summer) generation on apple in Germany over an area extending eastwards to beyond Berlin. In a further experiment near Bonn on the economic importance of this second generation [*cf. R.A.E.*, A **38** 225], pairs of apple trees were sprayed in 1949 with 0·05 per cent. E 605 forte [a 50 per cent. parathion emulsion concentrate] at intervals of about five days from 20th May to 11th July against the first generation only, from 16th July to 11th September against the second only or throughout the season against both generations, or were left untreated. The numbers of trees sprayed were too small to show statistically valid differences and observations on larvae taken in trap bands showed that the date chosen for the change from the first treatment to the second was somewhat too early, but there were no infested apples among those harvested from the trees that had received treatment against the second generation, whereas spraying against the first generation only was little better than no treatment. It is concluded that at least in the warmer parts of Germany treatment against the second generation is the more important, except on very early varieties of apple. Lead arsenate applied against the first generation gives some control of the second [*cf. loc. cit.*], but correct timing is important for sprays having a shorter duration of effectiveness.

Schwerdtfeger (F.). **Untersuchungen über die Wirkung von Hexamitteln bei der Engerlingsbekämpfung im Forstschutz.** [Investigations on the Effectiveness of BHC for the Control of Cockchafer Larvae in Forest Protection.]—*Z. PflKrankh.* **57** pt. 7–8 pp. 246–272, 4 graphs, 28 refs. Ludwigsburg, 1950.

In view of the good results given by BHC against larvae of *Melolontha* [*R.A.E.*, A **37** 443; **41** 185, etc.], numerous experiments were carried out in the field at several forestry stations in north-western Germany in 1948–49 to test the effectiveness of soil treatment in preventing damage to nursery stock. Some aspects of the work were further studied in the laboratory. Various proprietary dusts and, in a few cases, an emulsion or a suspension, containing 10–20 per cent. technical BHC were applied to the soil in April–May and worked in in different ways, and the effectiveness of the treatments was evaluated in early July and again in late September or early October by counting the numbers of plants that had died following attack by larvae of *Melolontha*, observing the rate of growth of the plants, and counting the numbers of larvae in samples of treated and untreated soil. Considerable control was afforded in 25 per cent. of the experiments, slight control in 50 per cent. and none in the remainder. The results are not given in detail, but general conclusions are drawn and examples cited to illustrate them.

BHC was more effective in preventing feeding than in killing the larvae. The latter migrated into the treated areas but usually not from them, and where there were several narrow treated strips separated by untreated ones, this may have apparently reduced the control obtained. No definite

relation was found between toxicity and the nature of the soil or its state of cultivation, though the results were more favourable on heavy soils than on light ones. They were above the general average for pine, about the average for spruce and beech and below it for larch, and better for plants one year old than for those two years old. Satisfactory protection was given by applying dusts at rates giving 0·15–0·3 oz. γ isomer per 100 sq. yards. Considerable mortality was obtained within five months with 0·6 oz. γ isomer per 100 sq. yards when the larvae were in the first, second or early third instar, but older larvae were more resistant. Adults ready to emerge from treated soil were killed or rendered incapable of flight, but females entering the soil to oviposit were not affected. The liquid preparations were effective at rates giving 3 oz. γ isomer per 100 sq. yards, but did not prevent feeding as rapidly as the dusts. In general, the effectiveness of the insecticide increased with the depth to which it was introduced. Doses of 1·8 oz. or more γ BHC per 100 sq. yards were sometimes fatal to one-year-old spruce. Pine was much less susceptible, but losses of larch up to two years old occurred even at 0·3–0·6 oz. per 100 sq. yards.

The effects of the treatments were severe on larvae of *Anomala* (*Phyllopertha*) *horticola* (L.), variable on wireworms and negligible on earthworms. The treatments were applied mostly or wholly against the resistant third-instar larvae of *Melolontha*, since 1949 was the year preceding the flight in the experimental area, and furthermore, dry weather prevented the larvae from rising to the upper layers of the treated soil, and these factors are believed to have contributed to the considerable proportion of doubtful or negative results. Treatment is best applied in the flight year before the adults emerge from the soil, and it will then remain effective against the first-instar larvae. The material should be worked in to a depth of 8 ins. at a rate of 0·6 oz. γ BHC per 100 sq. yards.

Buhk (F.). **Erfahrungen in der Bekämpfung der Johannisbeergallmilbe** *Eriophyes ribis* **Nal.** [Experience in the Control of *Cecidophyes ribis*.] —*Z. PflKrankh.* **57** pt. 7–8 pp. 281–282. Ludwigsburg, 1950.

Attempts to control *Cecidophyes* (*Eriophyes*) *ribis* (Westw.) on black currant in a garden in Hamburg in 1927 and the succeeding years by removing infested buds in spring and dusting the bushes with a mixture of lime and sulphur (1 : 2) or spraying with Solbar [barium polysulphide] or nicotine were unsuccessful, partly at least because of reinfestation from neighbouring plantings. When infested flower buds on twigs kept in a heated room opened, the mites did not crawl over the twigs and leaves as reported in the literature, but remained on the buds and, particularly when in direct sunlight, attached themselves to any object such as a hair or a needle, that was brought into contact with them. They were observed in the field in May similarly attaching themselves to the legs of Aphids released on the buds. This habit may account for the ease with which the mites spread.

Schäfer (R.). **Engerlinge des Brachkäfers** (*Rhizotrogus aestivus*) **als Schädlinge im Ackerbau.** [Larvae of *R. aestivus* as agricultural Pests.] —*Anz. Schädlingsk.* **23** pt. 12 pp. 185–187, 8 figs., 4 refs. Berlin, 1950.

The third-instar larvae of *Rhizotrogus aestivus* (Ol.), which are described in some detail, caused considerable injury to beet in a district in south-western Germany by feeding on the hairs on the lower third of the main

root and the side roots, causing the appearance of discoloured areas and wilting and curling of the leaves. The crop grown in the infested field two years previously, when oviposition was believed to have occurred, was lucerne. If land for which a beet crop is intended is found to be infested, preliminary soil treatment with BHC is recommended. Since the larvae migrate from plant to plant along the rows, it is useless to apply insecticides between the rows during the vegetative period.

Zischka-Winter (R.). **Über einen Koka-Schädling in Südamerika.** [On a Pest of Coca in South America.]—*Anz. Schädlingsk.* **24** pt. 1 pp. 10–12, 3 figs., 1 ref. Berlin, 1951.

Coca (*Erythroxylon coca*) is attacked in Bolivia by a species of *Eloria* that is apparently distinct from *E. noyesi* Schaus, which infests it in Peru [*cf. R.A.E.*, A **32** 430]. It has 3–4 generations a year, according to altitude, and the adults survive for only a few days. In observations, females laid up to 150 eggs each in small batches on the leaves, or on the twigs of defoliated plants. The larvae hatched in a few days, fed on the leaves and after about two months pupated on the shrubs or other plants. The pupal stage lasted 10–20 days. No parasites of the larvae were found, and the predators observed afforded little control. When the plants were defoliated the larvae, which have no other food-plant, fed on the twigs and many of those of the last generation died of starvation. They were readily controlled by dusting or spraying with 5–10 per cent. DDT.

Itzerott (H.). **Die Wirkungsweise von Aktiv-Gesarol.** [The Mode of Action of Aktiv-Gesarol.]—*Anz. Schädlingsk.* **24** pt. 4 pp. 55–57, 2 graphs. Berlin, 1951.

An account is given of laboratory tests carried out in Germany in 1950, showing that the initial toxicity to the granary weevil [*Calandra granaria* (L.)] of a product containing DDT and γ BHC and called Aktiv-Gesarol was greater than the sum of the toxicities of the two ingredients applied alone.

Adults of *C. granaria* were enclosed on filter papers that had been dusted under a bell-jar with the product or with each of its active components at a rate equivalent to 18 lb. per acre and kept at 20°C. [68°F.]. The resulting percentages of severely injured or dead weevils were 15, 0 and 5 for the product, DDT alone and γ BHC alone, respectively, after two hours, 73, 19 and 33 after six hours, and 100, 43 and 85 after 12 hours. When the experiment was repeated with the filter papers connected to a suction pump that drew off all vapours, γ BHC was only very slightly toxic, and DDT and the product were nearly equal in effect. In further tests, papers were dusted with γ BHC and covered either with others treated with DDT or with untreated paper or dusted with DDT alone, and weevils were confined on them. The percentages injured or killed were 80, 29 and 35, respectively, after 12 hours and 100, 78 and 70 after 24. In a final test, the insects were exposed for 30 minutes to DDT and γ BHC separately in either sequence or to the combined product. After 87 hours, the percentages dead and injured were 56 for γ BHC followed by DDT, 53 for DDT followed by γ BHC, and 92 for the product. It is concluded that the increased effectiveness of Aktiv-Gesarol is due to the fact that its two toxic constituents differ

in their mode of action, DDT acting as a contact poison and γ BHC mainly as a fumigant.

Paramonow (S. J.). **Über manche für die Ukraine und die Krim schädlichen "Fruchtfliegen" mit Quarantänebedeutung.** [On several injurious Fruit-flies of Quarantine Significance for the Ukraine and the Crimea.] —*Anz. Schädlingsk.* **24** pt. 4 pp. 58–59. Berlin, 1951.

As a result of the increased import of exotic plants into the Ukraine, the Crimea and the Caucasus in recent years, there is considerable danger that fruit-flies not indigenous in the region may become established there. The author recalls that *Ceratitis capitata* (Wied.) was introduced with crates of *Citrus* fruits into Odessa, Nikolaev and Kherson from Spain during the Spanish Civil War. Despite the destruction of all fruit and vegetable crops before harvest within a radius of about 15 miles of Odessa, larvae were found in the same year in small numbers on apricot in gardens there and on a wild apple tree near Nikolaev. None was found in the following year, but it is not known whether the fly was completely eradicated. It is also possible that fruit-flies from neighbouring regions may extend their distribution to include these southern parts of the Soviet Union. Thus, *Myiopardalis* (*Carpomyia*) *pardalina* (Big.), which is a serious pest of melons in Transcaucasia [*R.A.E.*, A **19** 370], is now present in North Caucasus near the frontiers of the southern Ukraine and the Crimea. A list is given of seven further fruit-flies, the introduction of which should be prevented.

[Ruivkin (B. V.).] Рывкин (Б. В.) **Some Questions relating to the Biology of the Tachinid** *Sturmia inconspicua* **Meig. (Diptera, Larvaevoridae) and its economic Importance.** [*In Russian.*]—*Dokl. Akad. Nauk SSSR* (N. S.) **76** no. 5 pp. 755–758, 7 refs. Moscow, 1951.

Observations on the bionomics of *Sturmia inconspicua* (Mg.) as a parasite of *Dendrolimus pini* (L.) on pine in the south of White Russia in 1948–50 showed that this Tachinid has two complete generations a year, the adults emerging in the first half of May and at the end of July and beginning of August, respectively. The summer adults oviposited in first-instar larvae of *D. pini* and the larvae overwintered in those of the host in the forest litter. In spring, the pupal stage averaged 13 days and the first adults emerged some 22–30 days after the hosts had ascended the trees. Emergence continued until 5th–18th May, thus coinciding with the appearance in the pine stands of larvae of *Panolis flammea* (Schiff.), *Lymantria* (*Ocneria*) *monacha* (L.), *L.* (*O.*) *dispar* (L.) and *Neodiprion sertifer* (Geoffr.), in all of which the females oviposited, *N. sertifer* being the commonest of these spring hosts. Their presence in foci of *D. pini* was thus very favourable for the maintenance and increase of the parasite.

In autumn, parasitised larvae of *D. pini* fed normally until they entered hibernation in October, usually in the third instar. They also reascended the trees normally in early April, but fed for only 4–7 days and then became immobilised, after which the larvae of the Tachinid left them and pupated. In this way, much damage by the voracious older larvae of *D. pini* was prevented. *S. inconspicua* should therefore be considered an important parasite of *D. pini*, although it does not attack the older larvae, and chemical control should not be applied in forests during its flight periods. Morphological characters distinguishing *S. inconspicua* from other Tachinid parasites of *D. pini* are described.

[Kozlova (E. N.) & Dvortzova (E. I.).] Козлова (Е. Н.) и Дворцова (Е. И.). **Rendering Plants toxic with organic Insecticides.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **17** no. 4 pp. 41–48, 4 graphs, 1 ref. Moscow, 1952.

The authors correlate the results of further work in the Soviet Union in 1950 on the use of organic chemicals as systemic insecticides [*cf. R.A.E.*, A **41** 100], those considered being DDT, BHC, and to a less extent parathion and a material of unstated composition termed preparation no. 47. Although it was shown that the chemicals are translocated when applied to the foliage, a dust applied to the leaves of cabbage in pots killing wireworms in the soil about the roots, most of the tests concerned absorption through the roots themselves. This was found to occur very rapidly, watering potted maize plants with a 0·0001 per cent. solution of BHC rendering the leaves toxic to hoppers of *Locusta migratoria* (L.) in 15 minutes and causing 25 per cent. mortality. The initial distribution of poison through the plant was irregular, larvae of *Stilpnotia salicis* (L.) that were fed on leaves from poplar branches standing in aqueous solutions of the insecticides showing 76·1, 61·7 and 49·7 per cent. mortality, according as the leaves were taken from the lower, middle and upper parts of the branches. This is attributed to the differences in age of the leaves, and this view was supported by observations on the mortality of *Myzus persicae* (Sulz.) on potted indoor plants watered once with a solution of DDT. The percentage reductions in the Aphid populations on the upper and lower leaves were 5·4 and 44·8 after one day, 23·8 and 62·2 after two, 82·7 and 91·4 after three, and 92·4 and 92·5 after four, the differences in mortality thus tending to even out as the leaves grew older. The reduced effectiveness in younger leaves is probably due to more rapid breakdown of the toxicant to non-toxic substances in the more rapidly growing plant parts.

Since photosynthesis is related to light intensity, the effect of light on toxicity was investigated by keeping wheat shoots infested by *M. persicae* in the dark or under artificial illumination. The plants were watered with a solution of DDT at a rate equivalent to about 1 lb. toxicant per acre, and there was a reduction of 50·3 per cent. after five days in the Aphid population on the plants kept in the dark, and none on those kept in the light. The effect of light intensity was further studied on young maize growing in a glasshouse under natural illumination in March. The plants were watered at 9 a.m. with a 0·0001 per cent. solution of BHC at 0·75 mg. active compound per plant, and the first pairs of leaves were picked at intervals through the day and given to hoppers of *L. migratoria*. The results showed that toxicity was high in the forenoon, fell to a low level at midday, rose again to a peak at about 3 p.m., and then declined. The peaks of toxicity are thought to coincide with periods of reduced photochemical activity in the leaves. When the leaves were picked at 9 a.m. on seven days in the course of a fortnight, toxicity increased for five days and then gradually declined to a low level.

The duration of toxicity in the field is affected by many factors, mainly the duration of contact of the roots with the toxicant, which is itself dependent on dosage and the mode of application. Thus, the percentage mortality of *Pocciloscytus cognatus* Fieb. released on beet in the region of Krasnodar was 31·2 when the seeds had been soaked for a day in a BHC solution, 62·5 when the seeds were dusted with BHC at 3·5 per cent. of their weight, and 68·7 when the soil was treated with BHC at 8·1 lb. per acre. Soil treatment generally gives the best results, but dusting the seed with BHC has proved successful against some insects, including *Oscinella frit* (L.) on cereals. Soil moisture greatly affects absorption by the roots,

and the experiments with *O. frit* showed that treatment was effective in regions with abundant rainfall for 4–6 weeks after sowing and ineffective where rainfall was low. This factor should render soil treatment very suitable for irrigated crops. In a test in Soviet Azerbaijan in August–September, cotton was treated with 0·0015 per cent. solutions of DDT, BHC, preparation no. 47 and parathion in the irrigation water (prepared by means of an intermediate solvent (OP-7) [polyethylene glycol ether]) at the normal irrigation rate (about 71,000 gals. per acre). The cotton was infested by *Aphis gossypii* Glov. and Tetranychid mites, and after 17 days, the population of the former was reduced by 69·7, 52·8, 71·1 and 38·6 per cent., respectively, and mortality of the latter, as compared with no treatment, was 49·5, 45·9, 38·8 and 38·8 per cent. Larvae of *Heliothis armigera* (Hb.) were caged on the plants ten days after treatment, and mortality after five days was 50, 35·6, 16·7 and 4·7 per cent., respectively. The toxicity of DDT and BHC to the mites increased throughout the period of the experiment, but that of preparation no. 47 and parathion reached its maximum in about five days and later declined. The lower effectiveness of the treatments against chewing insects as compared with sucking ones was confirmed in tests with *P. cognatus* and *Cleonus punctiventris* (Germ.) on beet and with hoppers of *L. migratoria* and adults of *Eurygaster integriceps* Put. on wheat. There are also specific differences in susceptibility, mortality of larvae of *S. salicis*, *Euproctis similis* (Fuessly) and *Malacosoma neustria* (L.) on branches standing in identical solutions being 60·3, 29·2 and 16·7, respectively. *S. salicis* was most susceptible to preparation no. 47, and *M. neustria* to BHC.

In tests against *E. integriceps* in Krasnodar, a 6 per cent. BHC dust was applied to the soil of plots at rates of 18 and 9 lb. per acre in April when the wheat had sprouted or to the seed before sowing at a rate giving 0·54 lb. BHC per acre. The plots were watered before the wheat sprouted, and eggs and adults of the bug were caged on the plants 15 and 25 days later, respectively. The results were estimated after a further 12 days and showed that the four treatments reduced the nymphal populations by 99·2, 79·8, 80·7 and 67·5 per cent. and killed 78·5, 42, 42·3 and 50 per cent. of the adults, as compared with the controls. Shoots from the plants were given to hoppers of *L. migratoria* and caused 63·6, 16·6, 33·4 and 42·8 per cent. mortality, respectively. The growth of the plants appeared to be considerably stimulated by all treatments. Wheat shoots standing in water solutions of DDT caused 78·4, 53·8 and 20·8 per cent. mortality in four days of nymphs of *E. integriceps* in the first three instars, respectively, that fed on them. In tests in the Kuban, grain crops were treated with aerosols of 10 per cent. DDT or of 15 per cent. DDT with 10 per cent. BHC in diesel oil in May. There was little or no mortality of the adult bugs, but the numbers of nymphs present 35–40 days after treatment were reduced by 40·1–53·8 and 71·7 per cent., respectively, as compared with the controls, although there was an increase in one of the tests with DDT alone. This effect on the nymphs is attributed to absorption of the insecticide by the plants and indicates the possibility of applying treatments against generations of a pest that have not yet developed.

[Anichkova (P. G.).] Аничкова (П. Г.). **Control Measures against the Acorn Weevil as a Means of preserving the Crop of Acorns.** [*In Russian.*] —*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **17** no. 7 pp. 35–36, 2 refs. Moscow, 1952.

In many districts in the Province of Voronezh, the entire yield of acorns is frequently destroyed by *Curculio glandium* Marsh., so that acorns for planting have to be brought from elsewhere. Observations in 1951 showed

that the acorns were sometimes also damaged by *C. venosus* (Grav.) and *C. pellitus* (Boh.), though these were rare. All three species overwintered as larvae or adults in the soil. The adults of *C. glandium* appeared on the surface at the end of April or beginning of May and were first observed on the flower-buds of fruit trees growing near oaks. In June they concentrated on birch catkins and on the flowers of lime trees [*Tilia*], and in mid-July they became abundant on fruit-bearing oaks and oviposited in the acorns. The larvae became full-fed from mid-August and then left the acorns. Infested acorns dropped in August and early September.

In experiments on control, a 12 per cent. BHC dust was applied to oaks at 18–36 lb. per acre against the adults of *C. glandium* at the end of July or beginning of August. Examination of samples of the acorns showed that very good protection was afforded, the percentages of sound acorns varying from 39 to 64 when the dust was dry and from 17 to 73 when it was moistened, as compared with 0–9 per cent. in the controls. Repeated collection of fallen acorns between 10th August and 10th September reduced the initial numbers of larvae in the soil to one-fourth of that in a control plot.

[Efremova (N. I.) & Khokhlov (D. N.).] Ефремова (Н. И.) и Хохлов (Д. Н.). **Green Oil as a Solvent for synthetic Insecticides in Aerosols for the Control of Granary Pests.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **17** no. 7 pp. 37–39, 8 refs. Moscow, 1952.

In the course of investigations in 1951 in the Soviet Union to find a better solvent than diesel oil for DDT or BHC applied as aerosols, a mineral oil referred to as green oil, which contains 52–98 per cent. aromatic hydrocarbons, was tested. The percentage solubility of DDT in a sample of this oil containing 90 per cent. aromatic hydrocarbons ranged from 40·2 to 44·9 at temperatures ranging from 5 to 30°C. [41–86°F.], as compared with 11·1–15 in diesel oil, the corresponding percentages for BHC being 17·3–20·4 and 3·2–4·8. It was also found that parathion, which is practically insoluble in diesel oil, was soluble in green oil in any desired proportions. In the summer of 1951, a 15 per cent. solution of BHC in green oil was used in aerosols in large-scale tests on the treatment of empty granaries in the Provinces of Krasnodar and Moscow, and the results showed that the use of the oil permitted considerable reductions in the amounts of solution used.

Rosický (B.) & Weiser (J.). **Boj s hmyzem. Část I. Moderní Insekticidy.** [Control of Insects. Part I. Modern Insecticides.]—438 pp., 100 figs., 38 pp. refs. Prague, Přírodověd. Vydavatelství, 1951. Price *Kčs.* 184.

This handbook is the first of a proposed series of five on the control of insect pests in Czechoslovakia and deals with the chemistry, the toxicity to insects and mammals and the uses of insecticides. It opens with a brief survey of the history of pest control, and this is followed by notes on the nature of chemical control and the different types of insecticides available. The bulk of the book (pp. 18–234) consists of sections concerned with particular insecticides classified as those of vegetable origin, inorganic compounds, fumigants, mineral- and tar-oil sprays, and organic insecticides, notably DDT and BHC, but including also the better known phosphorus compounds. The rest of the book comprises accounts of the different types

of insecticidal formulations, equipment for their application, and methods of testing their effectiveness and physical properties in the laboratory.

Box (H. E.). **List of Sugar-cane Insects. A synonymic Catalogue of the Sugar-cane Insects and Mites of the World, and of their Insect Parasites and Predators, arranged systematically.**—[5 +] 101 pp., 2½ pp. refs. London, Commonw. Inst. Ent., 1953. Price 15*s*.

This catalogue of the insects and mites associated with sugar-cane is based on the literature published up to the end of 1952, but contains some unpublished records. It is in two parts, of which the first comprises a systematic list of the insects and mites that feed on living or decaying tissues of sugar-cane (*Saccharum officinarum*) and other cultivated species of *Saccharum* and their hybrids, including secondary pests, but not general saprophagous species. It shows the alternative generic and trivial names, including erroneous names, under which the various species have been recorded, with cross references, and also the countries in which these species are known to feed on sugar-cane and their insect parasites and predators listed by genera. The second part comprises a similar list of the parasites and predators showing, in addition to the alternative names, the pests attacked by each on sugar-cane and the countries where such attack is known. An index to countries is included, as well as one to the genera of insects and mites.

India. The Destructive Insects and Pests Act, 1914, and the Rules framed thereunder by the Central Government for regulating the Import of Plants, etc., into India. Act No. II of 1914. (Amended up to April 1951.)—28 pp. Delhi, Manag. Publ., 1952.

This publication of the Government of India contains the text of the Destructive Insects and Pests Act of 1914 [*R.A.E.*, A **2** 273] as amended in 1950 and 1951, with the regulations made under it. The Act extends to the whole of India except the State of Jammu and Kashmir. The regulations concern the importation of living plants, parts of plants, fruits and vegetables for consumption, plant products, and living insects [**29** 290] and fungi, and the movement in India of plants and plant and wrapping materials likely to carry *Quadraspidiotus* (*Aspidiotus*) *perniciosus* (Comst.), *Icerya purchasi* Mask., or the bunchy-top disease of banana.

Hem Singh Pruthi & Mohan Singh. **Pests of stored Grain and their Control. (Third revised Edition.)**—*Indian J. agric. Sci.* **18** pt. 4 (Spec. no.), [5 +] ii + 88 pp., 15 pls. (3 col., 2 fldg.), 31 figs., 6 pp. refs. Delhi, 1950.

In this edition of a bulletin on pests of stored grain and pulses in India [*cf. R.A.E.*, A **32** 248; **35** 428], the text has been partly rewritten and rearranged to include some additional insect pests and to bring the information on control up to date. Sections on insects of general importance in warehouses, the sources of infestation and the factors that favour its development in stores, and the control of infestation in grain stored in bags and in grain and milled products in transit and of termites in building timbers have been added, and one on the natural resistance of grain to insect attack has been omitted.

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Part 2 consists of the more important plant pests and their distribution, listed under the crops arranged in alphabetical order.

Part 3 comprises the insects arranged in alphabetical order of genera and species under their respective orders with brief information and references relating to each insect.

Part 4 deals with weed control by insects and is arranged under the weeds in alphabetical order.

Part 5 deals very briefly with plant quarantine, virus vectors, insect control and research needs.

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